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TECHNICAL REPORT NO. LWL-CR-02E73

MULTISHOT THERMAL BATTERY

by

Alan A. Schneider; Supervising Chemist
Stephen E. Long; Supervising Engineer
George C. Bowser; Supervising Engineer

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| 20. ABSTRACT (Continue on reverse side if necessary and identify by block number) A summary of the development of a multishot thermal battery is presented. The battery is designed to power the AN/PRC-77 radio for at least four ten-minute cycles. Test regimens are described and test results detailed showing that the battery will meet electrical specifications when subjected to environmental preconditionings such as heat, cold, wind, vibration and dropping. Detailed engineering drawings have been prepared (a set is included in this report) | | |

20. ABSTRACT CON'T

and a set of operating instructions has been written (Appendix B, this report).

A brief description of some of the tests which led to the choice of cell chemistry is included. A chronological description of design improvements is given, from the first working prototype which was capable of four cycles to the final version which is capable of at least five reliable cycles.

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INTRODUCTION

The object of this study was the design and development of an externally heated multishot thermal battery which would power the AN/PRC-77 radio. The battery was to operate the radio for at least four cycles, each cycle consisting of five minutes of transmission followed by five minutes of reception. The battery was to be heated by a readily available military fuel such as trioxane.

Such a battery has been developed. When heated by trioxane, it is capable of operating the radio for as many as ten cycles. Activation times for the battery range from five minutes for the first few cycles to eight minutes for the final cycles.

The development of the battery was divided into three phases. Phase I involved the investigation of cell components such as anode, cathode and electrolyte. This phase also included investigation of the heat source and design of a battery case which would allow the cells to be heated quickly and efficiently. The culmination of Phase I was a proposed prototype design.

Phase II efforts centered on modification of the prototype design so that the battery would perform satisfactorily from an electrical and an operational standpoint. Burner height was increased to insure complete combustion of the fuel, cell spacing was adjusted for even heating of all cells, and design changes were incorporated which would make the system easier to use. Batteries were then subjected to environmental preconditioning and testing.

Based on these environmental test results, some minor changes were effected resulting in the final battery design. Phase III efforts centered on the production of twenty-five units of this design.

RESEARCH AND DEVELOPMENT PROGRAM

Phase I

Cell Development

The following materials were studied during the investigation of cell components:

1. Mg and Ca anodes.
2. LiCl-KCl and LiI-KI electrolytes.
3. CaCrO_4 , FeS_2 and CuO depolarizers.

The cell of choice used a Ca anode, LiCl-KCl electrolyte and a CaCrO_4 cathode (depolarizer). The choice was based primarily on electrical performance and secondarily on prior experience with the system. Tests show that both the Mg anode and FeS_2 cathode would also prove acceptable.

Based on initial test data and some thermal calculations, it was determined that, to achieve rapid activation, each individual cell would have to be exposed to the hot combustion gases of the burning fuel. This meant hermetically sealing each cell in a separate case. Conventional battery construction wherein all cells are sealed in a single case could not be used because activation times would be extremely long.

Several cell configurations were investigated to arrive at a reliable, complete cell. Major problems which were overcome were: (1) swelling due to moisture and gaseous reaction products and (2) formation of Li-Ca alloy at a rate which caused internal shorting of the cell. The swelling problems were eliminated by vacuum drying all components and by heating each cell to its operational temperature before final sealing. The shorting problems were overcome when a "Fiberfrax" gasket was included in the cell to absorb any excess Li-Ca alloy.

The resulting cell, shown in drawing 405756 proved to be very reliable. No failures have been encountered in the testing of more than 100 such cells. The cell is capable of delivering one ampere at 510°C for more than one hour, equivalent to twelve five-minute transmit cycles.

The final cell uses two calcium bimetal anodes and two depolarizer pellets made from a homogeneous mixture of LiCl-KCl electrolyte, CaCrO_4 depolarizer, and "Cab-O-Sil" binder. A screen is included in the depolarizer to provide better electrical contact with the pellet. These components are assembled and inspected according to Flow Chart 405756. For more detail concerning the components and assembly techniques, the full drawing package should be consulted (Appendix A).

Fuel Evaluation

Both the standard trioxane tablet and the US Army Land Warfare Laboratory (USALWL) Delrin tablet were examined as fuels. The former was the fuel of choice because of its even burning characteristics and ease of ignition. However, Delrin tablets could be used as an alternate heat source.

Although the heat contents of trioxane and Delrin are very nearly the same (3980 cal/g and 4300 cal/g respectively), the Delrin is a denser fuel. Thus, with Delrin, more heat can be packaged per unit volume. However, the denser Delrin is also more difficult to light, and its burning rate is uneven and dependent on physical configuration of the tablets. It is these unfavorable characteristics which prompted the choice of trioxane as the primary fuel.

Phase II

First Working Prototype

Initial Phase II efforts centered on the modification of the Phase I prototype design to meet the performance goals, and the testing of this modified design. Burner height was increased to allow the fuel to burn completely. Modifications were made to the spacing between cells and to the end cell geometry so that the hot combustion gases would heat each cell evenly and at the same rate. A sketch of this modified design is given in Figure 1. It was this design which was first able to meet the electrical specifications for the battery.

One of the first successful tests using this design is shown in Figure 2. The lower graph shows the performance of the full six-cell battery during the first cycle while the upper graphs give the performance of two individual cells.

One and two-thirds bars of trioxane were ignited at time zero and the battery voltage was allowed to rise under no load. At 3 minutes (point A), a 100 ma constant current load was applied which drove the battery voltage negative. By 4 minutes the battery was able to sustain the 100 ma load showing a voltage greater than 15 volts. At four minutes (point B) a one ampere load was applied, slightly depressing the cell output. Not until the temperature of the top of the cell cases reached about 350°C was the battery able to deliver 10.8 volts at one ampere (1.8 volts/cell). This occurred at 4 1/2 minutes (point C) and was considered activation time for the battery. Cell voltage rose to 15 volts during the next five minutes under one ampere load. During this period the trioxane flame turned yellow (point D) and the cap was placed on the assembly when the flame went out entirely (point E). At 9 1/2 minutes the load was diminished to 100 ma (point F) and the battery was allowed to run an additional five minutes. At 14 1/2 minutes (point G), the one ampere load was reapplied for 30 seconds to determine whether transmission was possible at the end of a ten minute cycle. This was indeed the case; although battery voltage began to fall, the voltage at the end of the 30 second period was above 13 volts. At 15 minutes (point H), the 100 ma load was reapplied while the battery cooled and the electrolyte froze.

Since peak temperatures were not excessive during cycle 1, it was decided that two full bars of trioxane could be used in the following three cycles. Graphs of battery output for cycles 2, 3, and 4 are shown in Figure 3. As the number of cycles increased, the activation time increased. The time necessary to reach 10.8 volts under a one ampere load are as follows:

| | |
|---------|------------|
| Cycle 1 | 4 1/2 min. |
| Cycle 2 | 5 1/4 min. |
| Cycle 3 | 5 1/4 min. |
| Cycle 4 | 6 1/4 min. |

Reaction products accumulate as current is drawn from the cell, requiring higher and higher temperatures to maintain the load. Peak voltages under

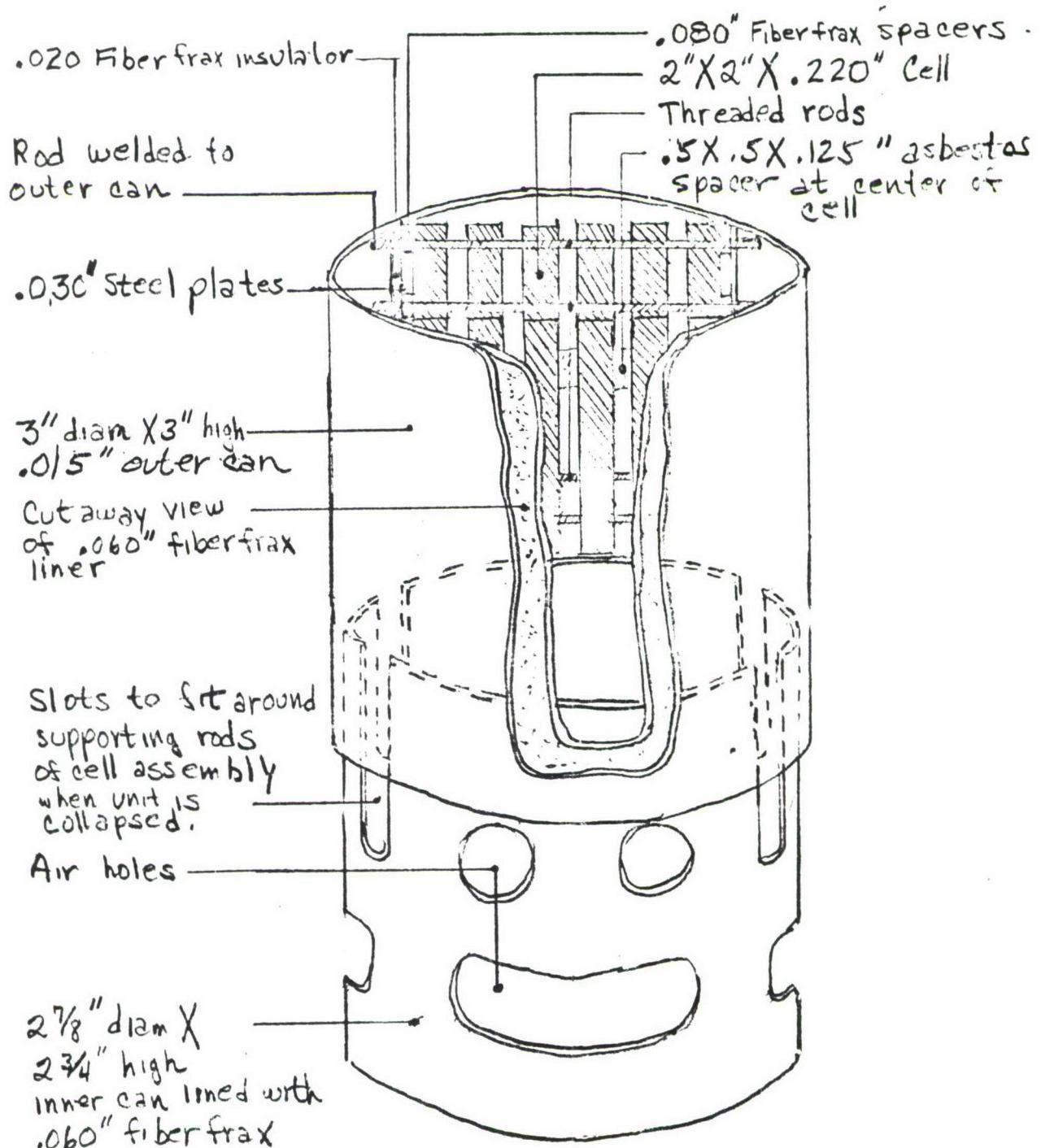


FIGURE 1. Sketch of six-cell battery with modified burner.

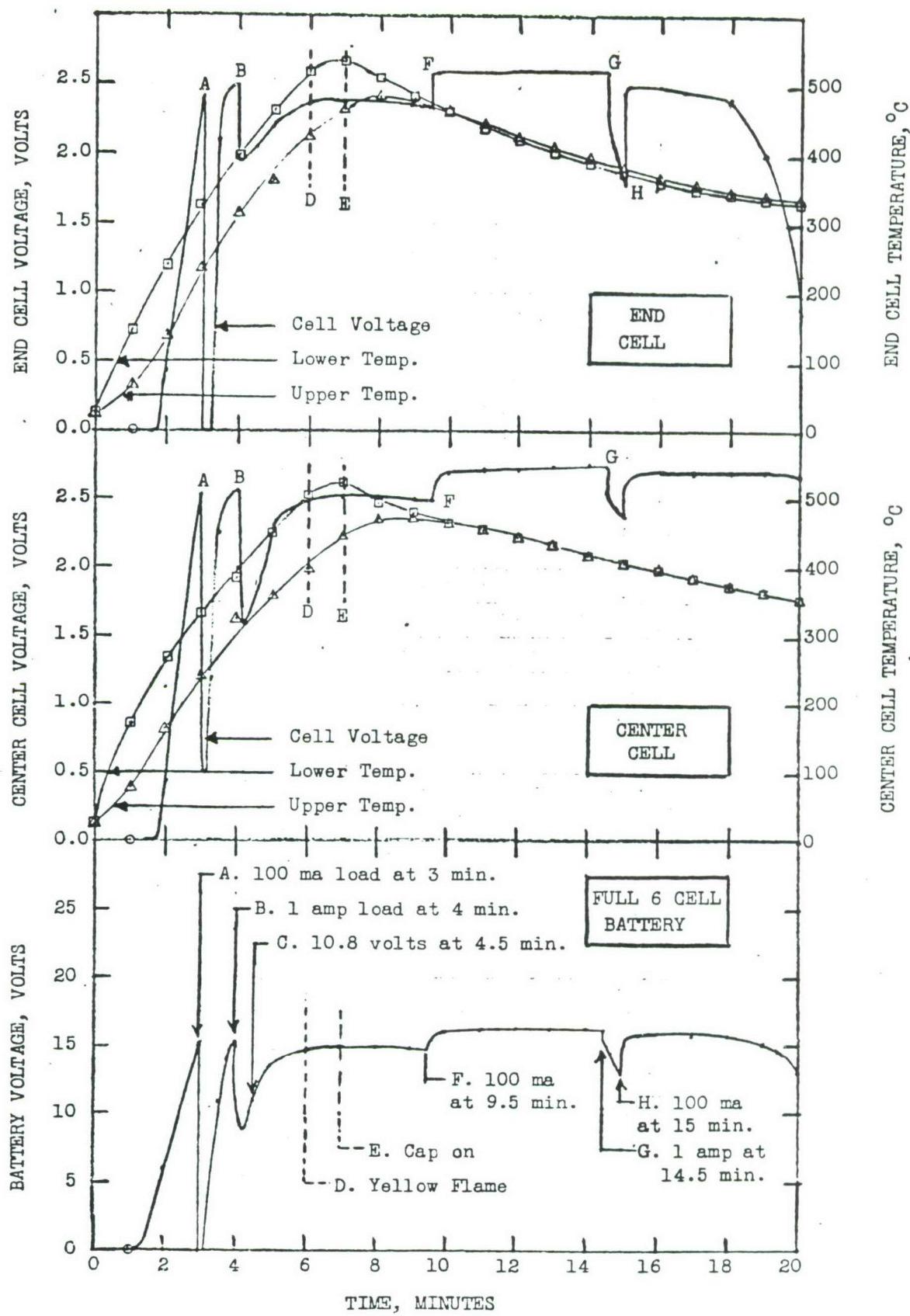


Fig. 2 First cycle performance of 6-cell battery using 1 and 2/3 bars trioxane fuel.

6.1

load also decrease as the number of cycles increases.

Thermal data for cycles 2, 3, and 4 are not given in Figure 3. These data are shown in Table 1 along with cycle 1 values.

The battery was able to supply the required one ampere for four 5-minute cycles at voltages above 11.5 volts. The total time the battery was loaded at one ampere was 25.75 minutes. Total time under the 100 ma load was at least 30 minutes. It was this design (Fig. 1) which was used as the basis for the development of the final design with more uniform heating and improved ruggedness.

Final Design

During the last report period, March 1 to June, 1974, the following was accomplished:

1. The mechanical design of the assembly was finalized and engineering drawings were completed.
2. Complete assemblies were tested under various environmental conditions and a fuel loading table was generated.
3. Twenty-five assemblies were completed for shipment.

Mechanical Design

Previous work had yielded a general configuration for the cell array and battery assembly. In order to make the assembly more rugged and capable of being handled repeatedly, it was necessary to make several design modifications. The major modifications were:

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FD-1
- A. Change from .015" to .032" steel outer case.
 - B. Addition of a .032" steel reinforcing ring to the top of the outer case at the point of cell array attachment.
 - C. Change from .060" to .020" outer case "Fiberfrax" insulator lining.
 - D. Addition of a .005" nickel sleeve covering "Fiberfrax" liner in outer case to eliminate tearing of Fiberfrax when the inner and outer cases are collapsed.
 - E. Reconfiguration of air vent holes in fuel can to eliminate catching on edge of outer can when collapsed and to make case more rigid.
 - F. Installation of "Fiberfrax" insulating pads on array frame to help prevent shorting in the event of cell shifting.
 - G. Adjustment of inter-cell spacing for more uniform heating.

After several mock-up assemblies were built to determine usableness, changes A thru F were incorporated and assembly FD-1 was tested (FD indicates final

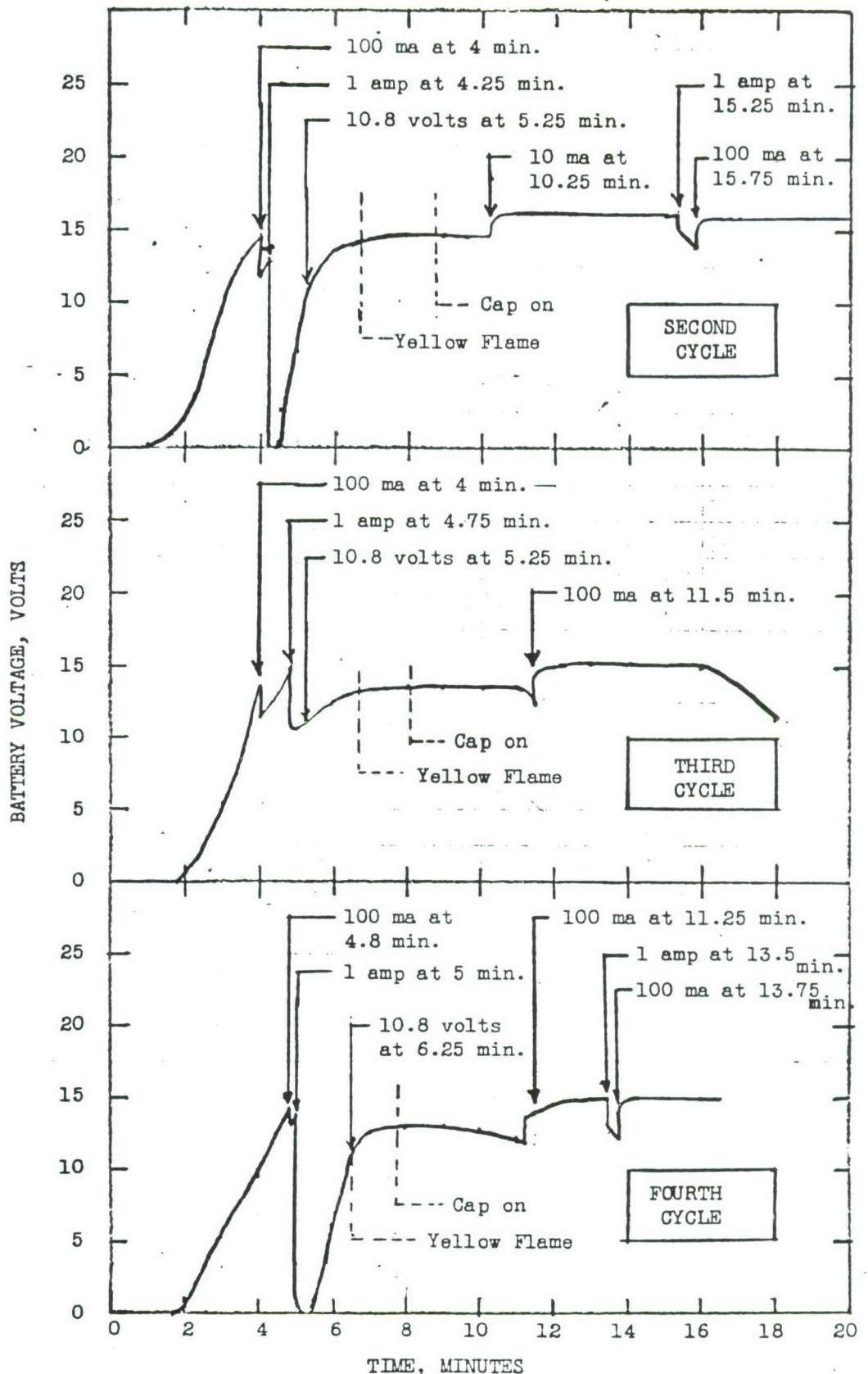


Fig. 3 Second, third and fourth cycle performance of 6-cell battery using 2 bars trioxane fuel.

TABLE 1
Temperature Profiles For Six-Cell Array

| Cycle 1 - 1 2/3 bars trioxane | | | | | Cycle 3 - 2 bars trioxane | | | | |
|-------------------------------|------------|-----|-------------|-----|---------------------------|------------|-----|-------------|-----|
| Time (min) | Temp. (°C) | | | | Time (min) | Temp. (°C) | | | |
| | End Cell | | Center Cell | | | End Cell | | Center Cell | |
| | Up | Low | Up | Low | | Up | Low | Up | Low |
| 1 | 65 | 144 | 80 | 173 | 1 | 56 | 135 | 86 | 148 |
| 2 | 139 | 239 | 166 | 269 | 2 | 120 | 242 | 144 | 248 |
| 3 | 235 | 328 | 246 | 338 | 3 | 221 | 329 | 232 | 317 |
| 4 | 318 | 398 | 328 | 385 | 4 | 308 | 405 | 302 | 378 |
| 5 | 362 | 464 | 361 | 449 | 5 | 350 | 472 | 351 | 439 |
| 6 | 424 | 519 | 400 | 505 | 6 | 428 | 529 | 408 | 497 |
| 7 | 467 | 533 | 449 | 512 | 7 | 496 | 590 | 462 | 558 |
| 8 | 484 | 511 | 472 | 494 | 8 | 511 | 574 | 491 | 550 |
| 9 | 478 | 486 | 475 | 479 | 9 | 517 | 543 | 505 | 528 |
| 10 | 465 | 464 | 466 | 467 | 10 | 503 | 512 | 504 | 508 |
| 11 | 447 | 443 | 457 | 455 | 11 | 485 | 487 | 495 | 493 |
| 12 | 429 | 424 | 445 | 444 | 12 | 466 | 464 | 483 | 478 |
| 13 | 412 | 406 | 433 | 432 | 13 | 443 | 444 | 466 | 464 |
| 14 | 396 | 390 | 421 | 420 | 14 | 429 | 425 | 451 | 449 |
| 15 | 382 | 376 | 410 | 408 | 15 | 411 | 407 | 436 | 434 |
| 16 | 368 | 363 | 398 | 397 | 16 | 395 | 391 | 423 | 421 |
| 17 | 354 | 350 | 387 | 385 | 17 | 380 | 376 | 409 | 408 |
| 18 | 346 | 344 | 376 | 375 | | | | | |
| 19 | 341 | 338 | 365 | 365 | | | | | |
| 20 | 335 | 331 | 356 | 355 | | | | | |
| 21 | 329 | 321 | 347 | 347 | | | | | |
| 22 | 315 | 310 | 340 | 341 | | | | | |
| Cycle 2 - 2 bars trioxane | | | | | Cycle 4 - 2 bars trioxane | | | | |
| 1 | 63 | 120 | 95 | 162 | 1 | 58 | 133 | 74 | 163 |
| 2 | 119 | 194 | 166 | 254 | 2 | 97 | 240 | 135 | 264 |
| 3 | 198 | 275 | 250 | 332 | 3 | 224 | 329 | 234 | 339 |
| 4 | 277 | 349 | 324 | 396 | 4 | 308 | 393 | 306 | 395 |
| 5 | 340 | 420 | 391 | 451 | 5 | 352 | 452 | 358 | 443 |
| 6 | 392 | 490 | 425 | 511 | 6 | 421 | 523 | 426 | 513 |
| 7 | 452 | 558 | 469 | 570 | 7 | 474 | 582 | 463 | 582 |
| 8 | 513 | 603 | 511 | 605 | 8 | 518 | 577 | 509 | 577 |
| 9 | 534 | 578 | 537 | 588 | 9 | 521 | 550 | 522 | 546 |
| 10 | 531 | 550 | 549 | 570 | 10 | 511 | 520 | 520 | 524 |
| 11 | 521 | 527 | 543 | 554 | 11 | 494 | 495 | 509 | 507 |
| 12 | 504 | 503 | 535 | 539 | 12 | 476 | 473 | 493 | 491 |
| 13 | 485 | 481 | 523 | 525 | 13 | 456 | 452 | 478 | 475 |
| 14 | 468 | 462 | 510 | 511 | 14 | 437 | 433 | 462 | 459 |
| 15 | 450 | 444 | 495 | 495 | 15 | 420 | 415 | 445 | 444 |
| 16 | 434 | 428 | 481 | 482 | 16 | 403 | 398 | 431 | 429 |
| | | | | | 17 | 389 | 384 | 418 | 417 |

design). The results of this test and others are reported in Table 2. In this table are listed the start times along with battery voltages and cell temperatures. Start time is defined as time to reach minimum battery voltage under the transmit load (See point C in Fig. 2 as an example). Battery voltages are given at the ends of the 5-minute transmit and 5-minute receive modes (See points F and G in Fig. 2 as examples).

It was evident from the results of FD-1 (long start and low temperature peak in center cell) that the cell separation needed adjustment. Unit FD-2 was constructed using the final, cell-separation configuration (modification G above). The test results indicate the assembly is very well balanced thermally. Ten cycles were obtained from this unit, the first five being shown in Table 2. Engineering drawings were prepared reflecting the final design. Drawings 405782 and 405785 have been included in this report to show the configuration of the final assembly. For more detail, the complete drawing package should be consulted (Appendix A).

Environmental Tests

The following tests were performed to determine the ruggedness and operability of the final design. In all tests involving operation, the assemblies were stabilized at the stated temperature prior to the start of each cycle. Experimental data for the environmental testing are given in Table 3.

A. Drop Test - Drop tests in accordance with Contract No. DAAD05-73-C-0555, section F, para. 5 were performed on a final design mock-up model. Shifting of cells and subsequent shorting to array frame resulted. The frame of the array was insulated with "Fiberfrax". Subsequent drop tests on unit FD-1 indicate the assembly will survive a drop of 2 1/2 ft. without causing excessive cell shift or shorting.

B. Cold Condition - Assembly ET-1 (Engineering Test Sample Number 1) was placed in a temperature chamber and allowed to stabilize at -65°F for two hours. The assembly was operated while it was in the temperature chamber. The assembly was cycled five times. The voltage on the third cycle was low due to insufficient fuel loading, all other cycles performed satisfactorily.

C. Hot Condition - Assembly ET-2 was placed in a temperature chamber and stabilized at +110°F. The assembly was operated while it was in the chamber. Four cycles were completed satisfactorily.

D. Wind - Assembly ET-3 was placed in a tube with a chimney for hot gases (see Fig. 4). Air was forced through the tube by means of a variable speed fan. Velocity was measured with a flowmeter. Three cycles were completed. The first was underheated but the second and third were satisfactory. It was then noted that the chimney was providing favorable air current for the assembly. The fourth cycle was tested on the bench with air blowing directly on the assembly. Almost no operational life was achieved. The flame came out the vent holes in the burner can. The assembly was shielded from the air flow and a fifth cycle completed successfully.

TABLE 2
Engineering Tests of Final Design

| S/N | Cycle | Conditions | Initial Temp. 25°C (77°F) | Bars of Trioxane | Start Time (Sec.) | Volts at end of 5 min. transmit | Peak Cell Temp. ($^{\circ}\text{C}$) | |
|-----|-------|------------|--|---------------------|-------------------------|------------------------------------|--|-------------|
| | | | | | | | End Cell | Center Cell |
| FD1 | 1 | Static | 1 1/2 | 385 | 10.4 | 12.8 | 453 | 380 |
| | 2 | " | 2 | 400 | 12.7 | 14.2 | 546 | 489 |
| | 3 | " | 2 1/3 | 435 | 11.3 | 13.7 | 574 | 515 |
| | 4 | " | 2 1/2 | 480 | 11.0 | 13.3 | 546 | 481 |
| FD2 | 1 | Static | 1 1/2 | 335 | 12.6 | 15.7 | 479 | 414 |
| | 2 | " | 1 2/3 | 335 | 14.6 | 16.3 | 557 | 513 |
| | 3 | " | 2 | 376 | 14.1 | 16.6 | 584 | 556 |
| | 4 | " | 2 | 400 | 13.0 | 13.0 | 578 | 552 |
| | 5 | " | 2 1/2 | 430 | 14.1 | 15.4 | 595 | 577 |

TABLE 3

TABLE 3 (cont.)
Environmental Tests

| S/N | Cycle | Conditions | Initial Temp. | Bars of Trioxane | Start | Time (Sec.) | Volts at end of 5 min. transmit | Peak Cell Temp. (°C) |
|-----------------------|-------|---------------|----------------|------------------|-------------|--------------------------------|---------------------------------|----------------------|
| | | | | | Time (Sec.) | Volts at end of 5 min. receive | End Cell Center Cell | |
| <u>Field Test</u> | | | | | | | | |
| ET4 | 1 | S.West Wind | 25°C (77°F) | 1 1/2 | 330 | 13.4 | 14.6 | - |
| | 2 | " | " | 1 2/3 | 360 | *4.0 | *4.0 | - |
| | 3 | " | " | 2 | 420 | *4.0 | *3.4 | - |
| | 4 | " | " | 2 1/2 | 420 | *1.5 | *2.0 | - |
| | 5 | " | " | 2 1/2 | 480 | *2.5 | *4.0 | - |
| <u>Vibration Test</u> | | | | | | | | |
| ET5 | 1 | Pre-Vibration | 25°C (77°F) | 1 1/3 | 320 | 14.3 | 15.6 | - |
| | 2 | " | " | 1 2/3 | 365 | 11.5 | 12.3 | - |
| | 3 | " | " | 2 | 430 | 11.4 | 12.0 | - |
| | 4 | " | " | 2 1/3 | 450 | *4.5 | 11.8 | - |

* Represents minutes of running time, end voltage was less than 11.25.

** Did not reach minimum voltage.

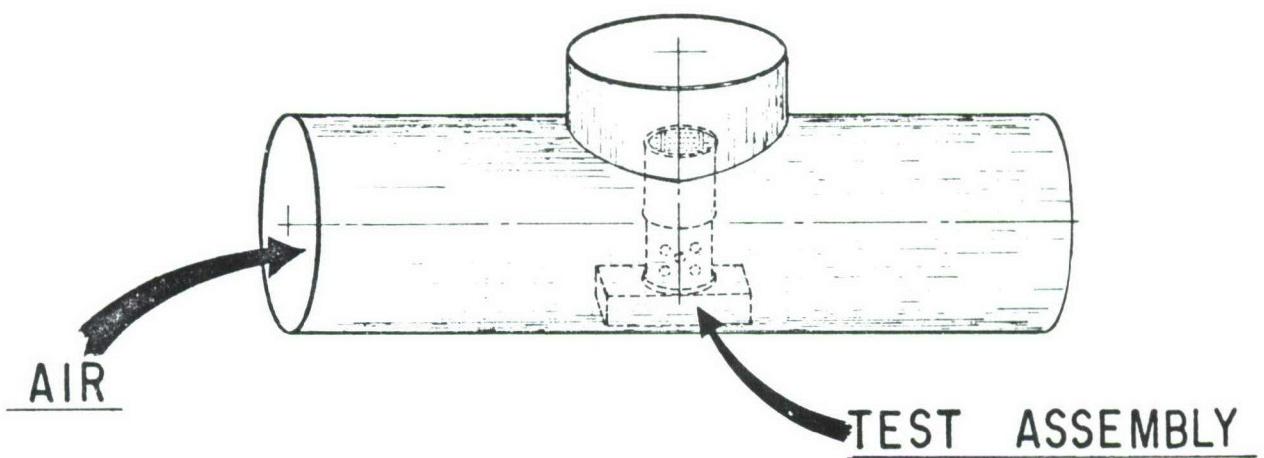


FIG 4

WIND TEST SETUP

E. Field Test - Assembly ET-4 was tested outdoors with wind conditions of 5 - 15 mph. The assembly was shielded on three sides. Four cycles were completed. Life was marginal.

F. Vibration - Assembly ET-5 was vibrated one hour on each of three perpendicular axis. The frequency was swept from 10 to 55 Hz and back to 10 Hz, once every minute of testing. The assembly was subsequently tested for four cycles of electrical operation.

The results of the environmental tests show the unit is capable of being operated over the temperature range of -65°F to $+110^{\circ}\text{F}$. The assembly will survive transportation vibration and repeated drops of 2 1/2 ft. or less onto a 2" fir plank. The assembly, however, must be completely shielded from air currents. This may be due in part to the fact that the trioxane fuel must be shielded from wind.

A table of correct fuel loading, Table I, Appendix B, was evolved using the results of the development and environmental tests.

Phase III

Following the completion of the design and environmental tests, twenty-five production units were assembled incorporating all modifications. Minor cosmetic modifications were made at this point, modifications such as addition of locator marks to aid in opening and closing the array.

A set of operating instructions was prepared and is included as Appendix B.

CONCLUSIONS

The feasibility of a multishot thermal battery has been demonstrated. Although the unit does not meet all the specifications of the original program, the major design objectives have been accomplished.

The following is a list of the more important accomplishments of the project:

1. Electrical requirements have been met without exceeding the desired size and weight limitations. (3" diam x 3" high; 1 1/2 lb.)
2. A highly reliable cell design has been generated. More than one hundred and fifty cells have been tested without failure.
3. A battery package has been developed which demonstrates the practicality of the multishot concept.
4. The battery is capable of operating over the full military temperature range (-65⁰F to +165⁰F), and will withstand moderate vibration and shock.
5. The fuel of choice (trioxane) is a standard military item.
6. No special skills are required to operate the battery.
7. No problems were encountered in interfacing the battery with the AN/PRC-77 radio.

RECOMMENDATIONS

Some of the areas which might be considered to improve the present design are:

1. Improved ruggedness.
2. Less sensitivity to wind.
3. Ability to operate continuously for periods greater than ten minutes.

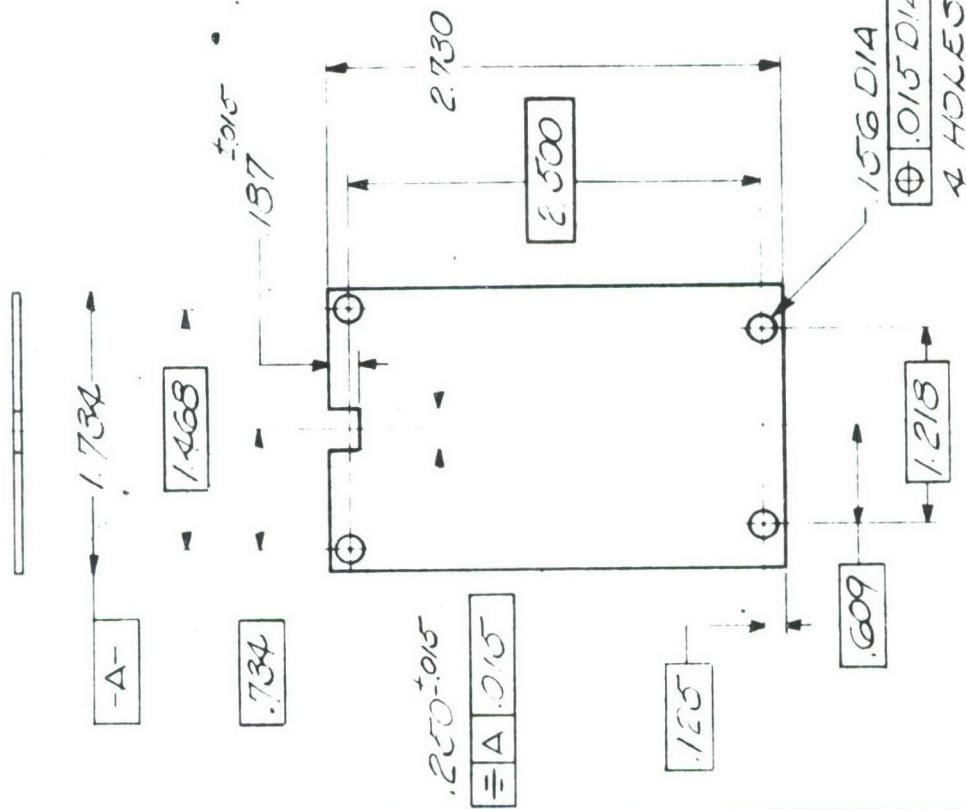
APPENDIX A

DRAWINGS

MATERIAL $Q30 \pm 002$ THICK STEEL CORROSION RESISTANT CLASS 300Z COND A FINISH STAINLESS STEEL 28 PER QQ-S-766

USED ON
405773

REVISIONS



030041028

PRECOUL/PLATE

405773

PART NO.

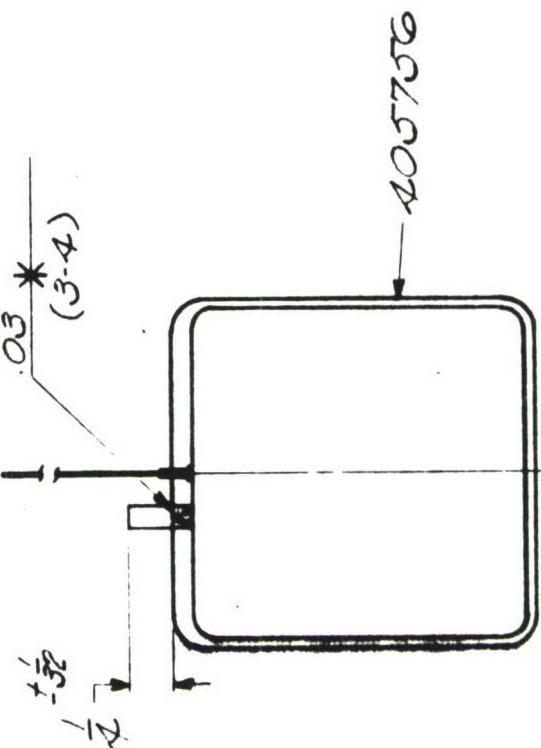
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APP'D

APP'D</

| MATERIAL | FINISH | PART NO. | DESCRIPTION | REQ'D. |
|----------|--------|----------|--------------|--------|
| | | 405756 | CELL ASST'Y. | 1 |
| 25919 | L.EAD | | | 1/16" |

25919
(1/16" L.G.)



REVISIONS

030041027

CELL ASST'Y.
W/L EAO

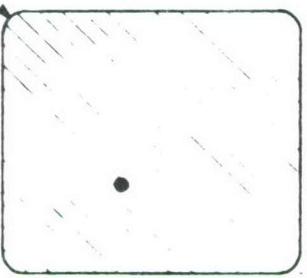
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PART
NO.

405756

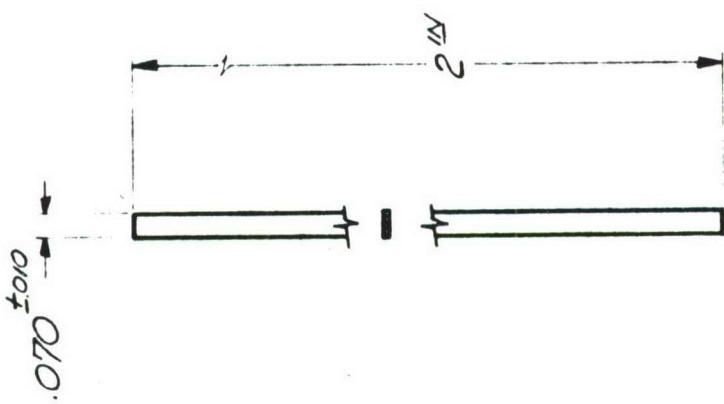
| CATALYST RESEARCH CORPORATION BALTIMORE, MARYLAND 21209 U.S.A. | INTERPRET DIMENSIONS AND SYMBOLS IN ACCORDANCE WITH USA:SI.Y 14.5 | SCALE | DR. CH'K'D | DWG. SIZE |
|---|---|----------------------------|------------|-----------|
| | | 1/16 | 5-22-72 | A4 |
| DIMENSIONS IN INCHES (BUILD OTHERWISE SPECIFIED) | TOLERANCES (BUILD OTHERWISE SPECIFIED) | | | |
| DECIMALS | .0015 | DO NOT SCALE DRAWING | APP'D | |
| FRACTIONS | $\pm 1/64$ | | APP'D | |
| ANGLES | $\pm 1/2^\circ$ | | APP'D | |

| MATERIAL | FINISH | TOOL NO T-9161 | USED ON 4032252 | | | | | | | | | | | | | | | | | | | | | | |
|---|--|----------------------------|--------------------|--|--|--|--------------|-------|-----|--|----------------|----------------|--------|--|-----------------|-------|--|--|------------------|-------|--|--|---------------------------------|----------------------------|-------|
| <p><i>1.00⁺0.02 THICK CALC. 14.5247 (ONE SIDE)</i></p> <p><i>NOTES:</i></p> <p><i>1.25L</i></p>  <p><i>1.600</i></p> <p><i>1.660</i></p> | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>REVISIONS</p> <p><i>NOTES OTHERWISE SPECIFIED: JEWELACES FOLIATED OR 45° PUNCHED OR DRILLED. PUNCHED, CUT, FORGED OR SHEARED SURFACES TO HAVE 125°.</i></p> | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>STOCK MATERIAL: <i>NOT TO SCALE</i></p> <p>NOTES: <i>1. VIVID COLOR 250-200-8-1</i></p> | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>030041005</p> <table border="1"> <thead> <tr> <th rowspan="2">CATALYST RESEARCH CORPORATION BALTIMORE, MARYLAND 21208 U.S.A. INTERPRET DIMENSIONS AND SYMBOLS IN ACCORDANCE WITH USASI-Y 14.5</th> <th colspan="2">DIMENSIONS IN INCHES (UNLESS OTHERWISE SPECIFIED)</th> <th rowspan="2">DWG. SIZE</th> </tr> <tr> <th>SCALE</th> <th>DR.</th> </tr> </thead> <tbody> <tr> <td></td> <td>.....</td> <td>.....</td> <td>CH'K'D</td> </tr> <tr> <td></td> <td>DO NOT SCALE</td> <td>APP'D</td> <td></td> </tr> <tr> <td></td> <td>SCALE DRAWING</td> <td>APP'D</td> <td></td> </tr> <tr> <td></td> <td>DECIMALS FRACTIONS ANGLES</td> <td>± .005 ± 1/64 ± 1/2°</td> <td>APP'D</td> </tr> </tbody> </table> | | | | CATALYST RESEARCH CORPORATION BALTIMORE, MARYLAND 21208 U.S.A. INTERPRET DIMENSIONS AND SYMBOLS IN ACCORDANCE WITH USASI-Y 14.5 | DIMENSIONS IN INCHES (UNLESS OTHERWISE SPECIFIED) | | DWG. SIZE | SCALE | DR. | | | | CH'K'D | | DO NOT SCALE | APP'D | | | SCALE DRAWING | APP'D | | | DECIMALS FRACTIONS ANGLES | ± .005 ± 1/64 ± 1/2° | APP'D |
| CATALYST RESEARCH CORPORATION BALTIMORE, MARYLAND 21208 U.S.A. INTERPRET DIMENSIONS AND SYMBOLS IN ACCORDANCE WITH USASI-Y 14.5 | DIMENSIONS IN INCHES (UNLESS OTHERWISE SPECIFIED) | | DWG. SIZE | | | | | | | | | | | | | | | | | | | | | | |
| | SCALE | DR. | | | | | | | | | | | | | | | | | | | | | | | |
| | | | CH'K'D | | | | | | | | | | | | | | | | | | | | | | |
| | DO NOT SCALE | APP'D | | | | | | | | | | | | | | | | | | | | | | | |
| | SCALE DRAWING | APP'D | | | | | | | | | | | | | | | | | | | | | | | |
| | DECIMALS FRACTIONS ANGLES | ± .005 ± 1/64 ± 1/2° | APP'D | | | | | | | | | | | | | | | | | | | | | | |

MATERIAL .040 THICK FIBERFAX SHEET
PER MO 293142

USED ON
403736

REVISIONS



030041007

ADJUSTOR
RECTANGLE

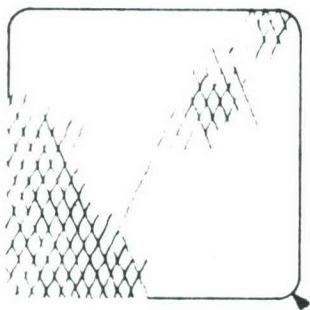
CATALYST RESEARCH CORPORATION
BALTIMORE, MARYLAND 21209 U.S.A.
INTERPRET DIMENSIONS AND SYMBOLS IN
ACCORDANCE WITH USASI-Y 14.5

| D | PART NO. | DWG. SIZE | DR. CH'K'D | SCALE | DIMENSIONS IN INCHES (UNLESS OTHERWISE SPECIFIED) | TOLERANCES (UNLESS OTHERWISE SPECIFIED) |
|-------|----------|-----------|------------|-------|--|--|
| APP'D | APP'D | APP'D | APP'D | APP'D | DO NOT SCALE DRAWING | DECIMALS .005 FRACTIONS \pm 1/64 ANGLES \pm 1/2° |

MATERIAL 1005 IRON METAL, EXPANDED
187 MESH PER

FINISH

USED ON
403627



1/2^{3/8} ± .050

1/4^{3/8} ± .050

3/8

REVISIONS

0300041008

OCREEN

4057751

PART
NO.

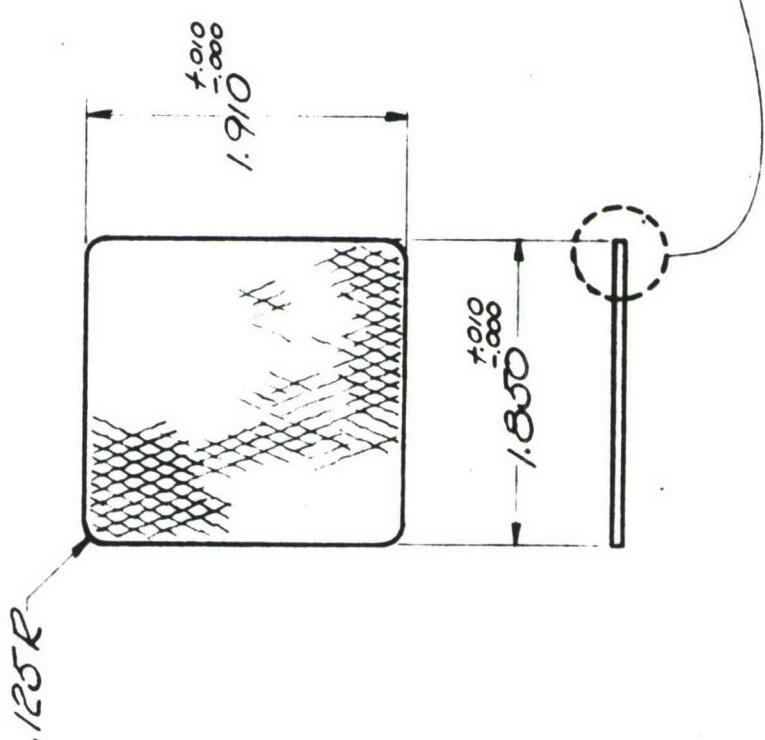
| CATALYST RESEARCH CORPORATION BALTIMORE, MARYLAND 21209 U.S.A. | DIMENSIONS IN INCHES (UNLESS OTHERWISE SPECIFIED) | | SCALE..... | | DR. CH'K'D | DR. APP'D | DWG. SIZE |
|---|--|--------|-----------------|-------|---------------|--------------|--------------|
| | TOLERANCES (UNLESS OTHERWISE SPECIFIED) | | | | | | |
| INTERPRET DIMENSIONS AND SYMBOLS IN ACCORDANCE WITH USASI-Y 14.5 | DECIMALS | ± .005 | DO NOT SCALE | APP'D | D | APP'D | APP'D |
| | FRACTIONS | ± 1/64 | DRAWING | APP'D | | | |
| | ANGLES | ± 1/2° | | | | | |

| MATERIAL | FINISH | DESCRIPTION | REQ'D. | USED ON |
|----------|------------------------|-------------|--------|---------|
| 405751 | WC SCREEN | | / | 405751 |
| 405501 | HOMOGENEOUS GELLET MIX | AP | | |

REVISIONS

NOTES:

1. REFER TO 405751 FOR CONTOUR LINES.
2. APPLY SCREEN AT SURFACE OF POWDER FILL (REF TO DRAWING).



030041002

405751
ELECTRAVITE & GELLET

CATALYST RESEARCH CORPORATION
BALTIMORE, MARYLAND 21209 U.S.A.
INTERPRET DIMENSIONS AND SYMBOLS IN
ACCORDANCE WITH USASI-Y-14.5

| PART NO. | SCALE | DR. | CH'K'D | DWG. SIZE |
|----------|----------------------|-------|--------|-----------|
| | | / | / | D |
| 405647 | DO NOT SCALE DRAWING | APP'D | APP'D | APP'D |

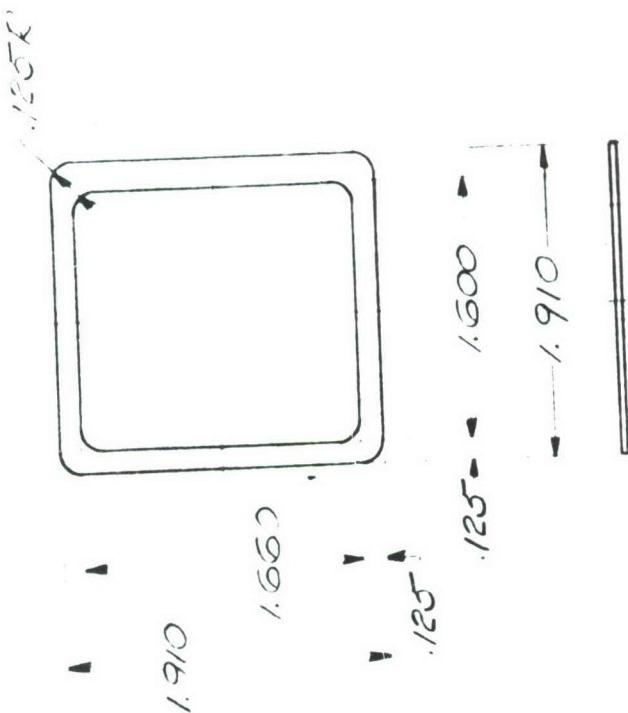
USED ON
403736

MATERIAL OATO THICK FIBER-TRAX SHEET
PER M5 29 $\frac{1}{4}$

FINISH

REVISIONS

1 1/20-72 1/32
2-5-72 0.92
MARCH 1985 0.92
ACG, 1/910 MWS
1.875



030041006

INVENTOR
405653

| DWG. SIZE | DR. | SCALE | | TOLERANCES (UNLESS OTHERWISE SPECIFIED) | |
|--------------|-----|----------------------------|----------------------------|--|-------|
| | | 1/2 | 1/4 | APP'D | APP'D |
| D | D | DO NOT SCALE DRAWING | DO NOT SCALE DRAWING | APP'D | APP'D |

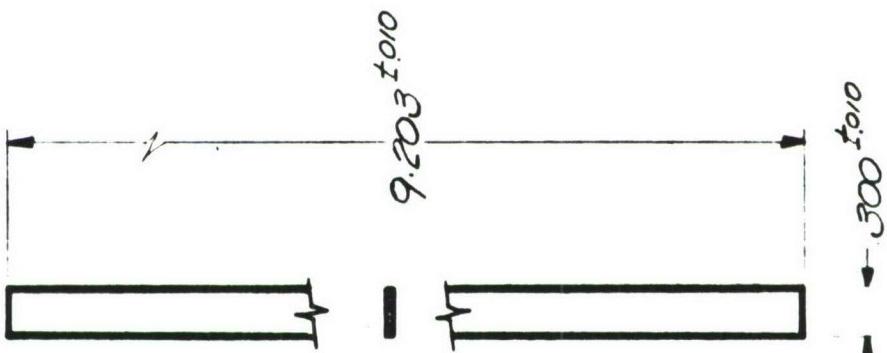
| | | | | |
|---|--|-------------------------------|-------------------------------|-------------------------|
| CATALYST RESEARCH CORPORATION BALTIMORE, MARYLAND 21209 U.S.A. | DIMENSIONS IN INCHES (UNLESS OTHERWISE SPECIFIED) | SCALE 1/2 | DR. CH'K'D | 1. C = 10-5-72 |
| INTERPRET DIMENSIONS AND SYMBOLS IN ACCORDANCE WITH U.S.A.Y 14.5 | TOLERANCES (UNLESS OTHERWISE SPECIFIED) | | | |
| | DECIMALS $\pm .01^{\circ}$ | DECIMALS $\pm .01^{\circ}$ | DECIMALS $\pm .01^{\circ}$ | FRACTIONS $\pm 1/64$ |

MATERIAL $0.32 \pm .003$ THICK STEEL CARBON
SHEET CRCP PER QQ-J-698

FINISH

USED ON
203766

REVISIONS



030041022

RIM CASE

205766

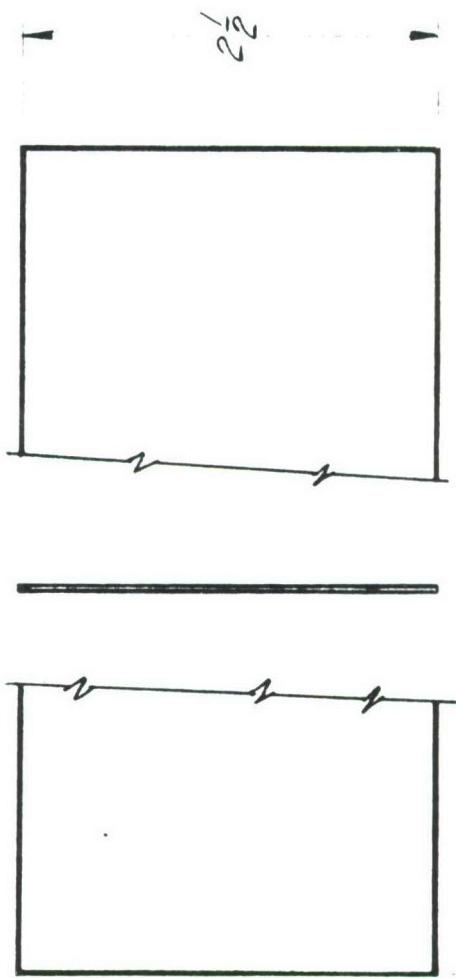
| CATALYST RESEARCH CORPORATION | | DIMENSIONS IN INCHES (UNLESS OTHERWISE SPECIFIED) | SCALE $\frac{1}{1}$ | DR. CH'K'D | DWG. SIZE | |
|--|--|--|------------------------|---------------|----------------------------|-------------|
| | | | | | DO NOT SCALE DRAWING | PART NO. |
| BALTIMORE, MARYLAND 21209 U.S.A. | | DECIMALS $\pm .005$ | APP'D | | APP'D | APP'D |
| | | FRACTIONS $\pm 1/64$ | | | | |
| | | ANGLES $\pm 1/2^\circ$ | | | | |
| INTERPRET DIMENSIONS AND SYMBOLS IN ACCORDANCE WITH USASI-Y 14.15 | | | | | | |

MATERIAL .020 THICK FIBREGLASS SHEET
PER GOOD

USED ON
403769

REVISIONS

030041023



9 $\frac{15}{16}$

1

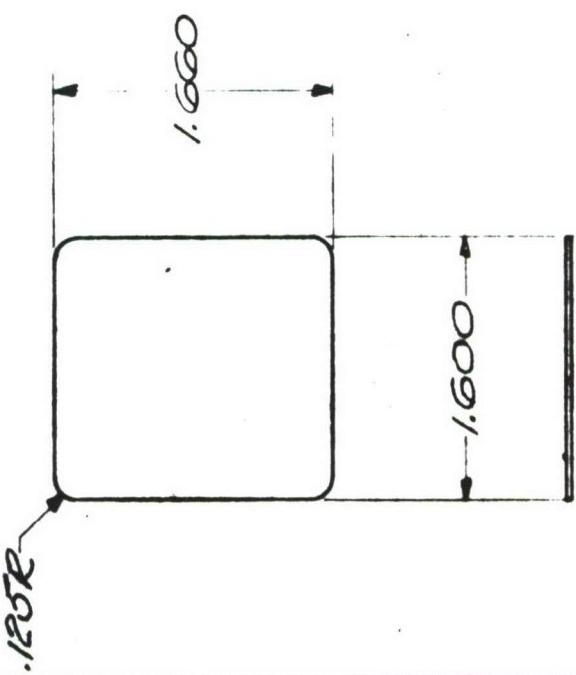
1

| | | | | | |
|---|--|--------------------|-----------------|---------------|--------------|
| CATALYST RESEARCH CORPORATION BALTIMORE, MARYLAND 21209 U.S.A. | DIMENSIONS IN INCHES (UNLESS OTHERWISE SPECIFIED) | | DR. CH'K'D | J-5/F J-20-74 | DWG. SIZE |
| | TOLERANCES (UNLESS OTHERWISE SPECIFIED) | | | | |
| INTERPRET DIMENSIONS AND SYMBOLS IN ACCORDANCE WITH USASI-Y 14.5 ACCORDANCE WITH USASI-Y 14.5 | DECIMALS | $\pm .005$ | DO NOT SCALE | D | PART NO. |
| | FRACTIONS | $\pm \frac{1}{64}$ | APP'D | APP'D | 405767 |
| | ANGLES | $\pm 1/2^\circ$ | APP'D | APP'D | |

| | | | | | |
|----------|------------------------------|--------|--|--------------------|-------------------|
| MATERIAL | .005 X 3/8 INCH NICKEL STRIP | FINISH | | BOOK NO. F-9161 | USED ON 203753 |
|----------|------------------------------|--------|--|--------------------|-------------------|

NOTE:

1. UNLESS OTHERWISE SPECIFIED:
SURFACE ROUGHNESS AS
ROLLED OR DRAWN.
PUNCHED, CUT, FORMED
OR SHEARED SURFACES
TO HAVE 125



REVISIONS

030041010

COMPRESSION PLATE

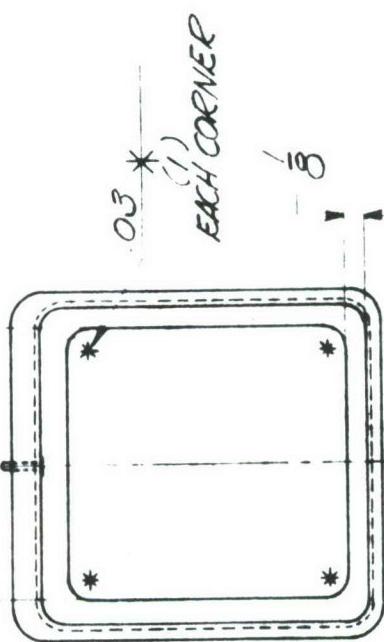
| CATALYST RESEARCH CORPORATION BALTIMORE, MARYLAND 21202 U.S.A. | DIMENSIONS IN INCHES (UNLESS OTHERWISE SPECIFIED) | | DR. CH'K'D | .005-.012 NOT SCALE | DWG. SIZE |
|--|--|-------------------------|---------------|---------------------------|--------------|
| | TOLERANCES (UNLESS OTHERWISE SPECIFIED) | | | | |
| INTERPRET DIMENSIONS AND SYMBOLS IN ACCORDANCE WITH U.S.A.S.Y. 14.3 | DECIMALS $\pm .005$ | FRACTIONS $\pm 1/64$ | APP'D | APP'D | D |
| | ANGLES $\pm 1/2^\circ$ | | APP'D | APP'D | PART NO. |
| | | | | | 405753 |

| MATERIAL | FINISH | USED ON | | |
|----------|--------|---------------------------|---------------|--------|
| | | PART NO. | DESCRIPTION | REQ'D. |
| | | 405785 | CERAMIC CUP | / |
| | | MASTER COMPENSATION PLATE | | / |
| | | 22573 | FLUX | 4C |
| | | 26570 | SOLDER CLOUTS | 4P |
| | | 627088 | JEAN TERMINAL | 4K |
| | | REVISIONS | | |

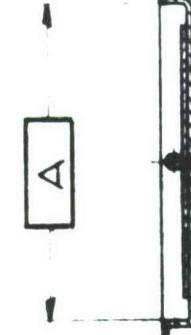
NOTE:

1. BREAK 1/4" ACCORDING
WITH MUR-ER-788?

→ = A.010 TOTAL



405753



405753



15 ± 0.05°
(NOTE 1)

03000410II

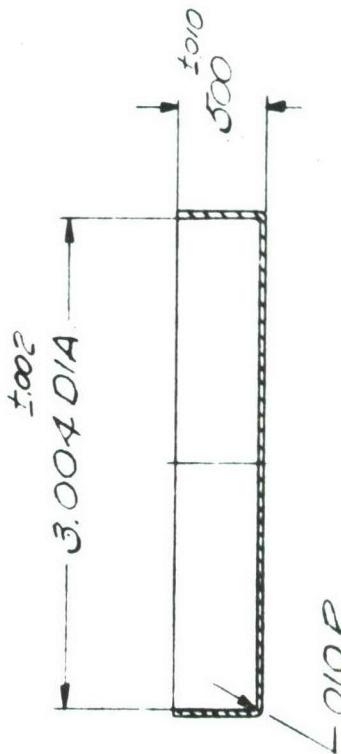
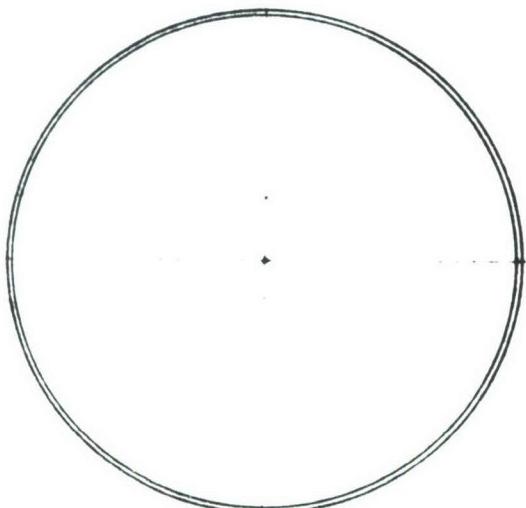
| CATALYST RESEARCH CORPORATION BALTIMORE, MARYLAND 21208 U.S.A. | INTERPRET DIMENSIONS AND SYMBOLS IN ACCORDANCE WITH U.S.A.Y 14.5 | DIMENSIONS IN INCHES (UNLESS OTHERWISE SPECIFIED) | | SCALE 1/16 | DR. USE 5-6-78 CH'K'D | DWG. SIZE | NOTE A55-Y |
|---|---|--|---------------------|---------------|--------------------------|------------------|---------------|
| | | DO NOT SCALE | DRAWING | | | | |
| | | DECIMALS ± .005 | FRACTIONS ± 1/64 | APP'D | APP'D | D PART NO. | 405753 |
| | | DECIMALS ± .005 | FRACTIONS ± 1/2° | APP'D | APP'D | | |

| MATERIAL | FINISH | USED ON 405755 | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|-------------------|----------------------------|--|---------------|-------------|-----------------|--------------|--|--|--------|-------|---------------|-----------------|--|----------------------------|-------|--------|------------------|--|-------|-------|--|---------------|--|-------|-------|--|
| PART NO. | DESCRIPTION | REQ'D. | | | | | | | | | | | | | | | | | | | | | | | | | |
| 405759 | COVER CELL | - | | | | | | | | | | | | | | | | | | | | | | | | | |
| 405753 | COMPRESSION PLATE | - | | | | | | | | | | | | | | | | | | | | | | | | | |
| REVISIONS | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p style="text-align: right;">405753</p> <p style="text-align: right;">405649</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>030041012</p> <p>CATALYST RESEARCH CORPORATION BALTIMORE, MARYLAND 21208 U.S.A. INTERPRET DIMENSIONS AND SYMBOLS IN ACCORDANCE WITH ASA:SI-Y 14.5</p> <table border="1"> <thead> <tr> <th colspan="2">DIMENSIONS IN INCHES (UNLESS OTHERWISE SPECIFIED)</th> <th>SCALE //</th> <th>DR. 45° 45° 45°</th> <th>DWG. SIZE</th> </tr> <tr> <th colspan="2">TOLERANCES (UNLESS OTHERWISE SPECIFIED)</th> <th>CH'K'D</th> <th>APP'D</th> <th>D PART NO.</th> </tr> </thead> <tbody> <tr> <td colspan="2">DECIMALS ± .005</td> <td>DO NOT SCALE DRAWING</td> <td>APP'D</td> <td>405755</td> </tr> <tr> <td colspan="2">FRACTIONS ± 1/64</td> <td>APP'D</td> <td>APP'D</td> <td></td> </tr> <tr> <td colspan="2">ANGLES ± 1/2°</td> <td>APP'D</td> <td>APP'D</td> <td></td> </tr> </tbody> </table> <p>COVER A55Y</p> | | | DIMENSIONS IN INCHES (UNLESS OTHERWISE SPECIFIED) | | SCALE // | DR. 45° 45° 45° | DWG. SIZE | TOLERANCES (UNLESS OTHERWISE SPECIFIED) | | CH'K'D | APP'D | D PART NO. | DECIMALS ± .005 | | DO NOT SCALE DRAWING | APP'D | 405755 | FRACTIONS ± 1/64 | | APP'D | APP'D | | ANGLES ± 1/2° | | APP'D | APP'D | |
| DIMENSIONS IN INCHES (UNLESS OTHERWISE SPECIFIED) | | SCALE // | DR. 45° 45° 45° | DWG. SIZE | | | | | | | | | | | | | | | | | | | | | | | |
| TOLERANCES (UNLESS OTHERWISE SPECIFIED) | | CH'K'D | APP'D | D PART NO. | | | | | | | | | | | | | | | | | | | | | | | |
| DECIMALS ± .005 | | DO NOT SCALE DRAWING | APP'D | 405755 | | | | | | | | | | | | | | | | | | | | | | | |
| FRACTIONS ± 1/64 | | APP'D | APP'D | | | | | | | | | | | | | | | | | | | | | | | | |
| ANGLES ± 1/2° | | APP'D | APP'D | | | | | | | | | | | | | | | | | | | | | | | | |

| | | |
|-----------|--|--------|
| MATERIAL | 0.02 THICK STEEL COPROOFING CEILING SHEET, CLASS 300 COVA | FINISH |
| A, FINISH | 28 PER SQ FT - 25 CSE | |

USED ON
4005783

REVISIONS



030041037

CAD

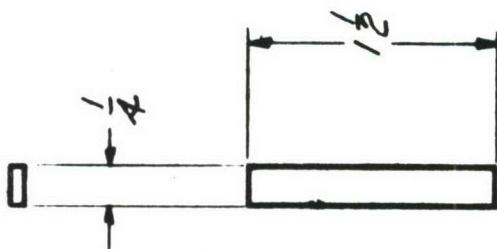
4005783

| CATALYST RESEARCH CORPORATION | | DIMENSIONS IN INCHES (UNLESS OTHERWISE SPECIFIED) | SCALE 1/16 | DR. CH'K'D | DWG. SIZE 5'-00-7/8 |
|---|--|--|---------------|---------------|---------------------------|
| | | | | | |
| BALTIMORE, MARYLAND 21209 U.S.A. | | DO NOT SCALE | APP'D | | |
| INTERPRET DIMENSIONS AND SYMBOLS IN ACCORDANCE WITH U.S.A.S.I.Y 14.5 | | DRAWING | APP'D | D | PART NO. |
| | | DECIMALS $\pm .005$ | APP'D | | |
| | | FRACTIONS $\pm 1/64$ | APP'D | | |
| | | ANGLES $\pm 1/2^\circ$ | APP'D | | |

| | | | |
|----------|--------------------------------|--------|--|
| MATERIAL | 0.095 THICK MIN-K SHEET PER | FINISH | |
|----------|--------------------------------|--------|--|

USED ON
405779

REVISIONS



030041034

INJECTATOR
RECTANGLE

405779

PART
NO.

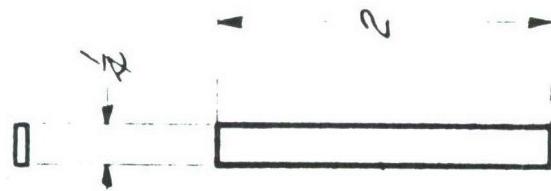
| CATALYST RESEARCH CORPORATION BALTIMORE, MARYLAND 21209 U.S.A. | DIMENSIONS IN INCHES (UNLESS OTHERWISE SPECIFIED) | | DR. CH'K'D | SCALE 1/16 | DWG. SIZE |
|---|--|-------------------------|-------------------------|---------------|--------------|
| | TOLERANCES (UNLESS OTHERWISE SPECIFIED) | | | | |
| INTERPRET DIMENSIONS AND SYMBOLS IN ACCORDANCE WITH ASA Y 14.5 | DECIMALS $\pm .005$ | FRACTIONS $\pm 1/64$ | NOT SCALE DRAWING | | D |
| | ANGLES $\pm 1/2^\circ$ | | | | PART NO. |
| | | | APP'D | | 405779 |
| | | | APP'D | | |
| | | | APP'D | | |

MATERIAL 080 THICK FIBERFAX SHEET
PER 600/77

FINISH

USED ON
405778

REVISIONS



0300041033

| CATALYST RESEARCH CORPORATION | | DIMENSIONS IN INCHES (UNLESS OTHERWISE SPECIFIED) | | SCALE 1/16 | | DR. U.S.F U.S.E.P. | | Dwg. SIZE | | DO NOT SCALE | | DRAWING | |
|---|--|--|--|-------------------------|--|---------------------------|--|--------------|--|-----------------|--|---------|--|
| BALTIMORE, MARYLAND 21209 U.S.A. | | TOLERANCES (UNLESS OTHERWISE SPECIFIED) | | CM'S'D | | APP'D | | APP'D | | APP'D | | APP'D | |
| INTERPRET DIMENSIONS AND SYMBOLS IN ACCORDANCE WITH USASI Y 14.5 | | DECIMALS $\pm .005$ | | FRACTIONS $\pm 1/64$ | | ANGLES $\pm 1/2^\circ$ | | DRAWING | | PART NO. | | 405778 | |
| | | | | | | | | | | | | | |

2.125REF

Note:

105/1



2.187
155.

111-2-000 D/4 HAVE
0.005 D/4

020 E
77-12

二

卷之三

120

- 262 -

三

- 1 -

247

152

A-A

0300041003

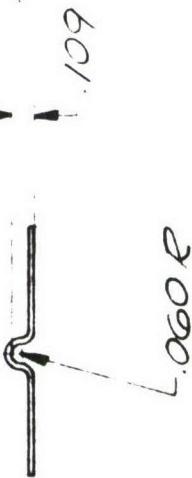
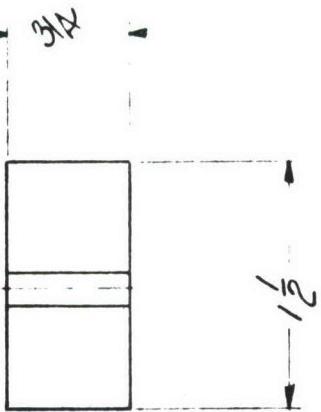
ILL CUP
405648

| CATALYST RESEARCH CORPORATION | | INTERPRET DIMENSIONS AND SYMBOLS IN ACCORDANCE WITH USASI-Y 14.5 | | DIMENSIONS IN INCHES (UNLESS OTHERWISE SPECIFIED) TOLERANCES (UNLESS OTHERWISE SPECIFIED) | | SCALE <i>1/16 & 1/32</i> | DR. CH'K'D | C E L L C U P | | DWG. SIZE |
|----------------------------------|--------|--|--------|--|--------|---------------------------------|---------------|---------------|--|--------------|
| BALTIMORE, MARYLAND 21209 U.S.A. | | | | | | DO NOT SCALE | APP'D | D | | PART NO. |
| DECIMALS | ± .005 | FRACTIONS | ± 1/64 | ANGLES | ± 1/2° | | APP'D | 205648 | | |
| | | | | | | | APP'D | | | |

MATERIAL 1/16" THICK STEEL COATED ON
BENT/STAMPING SHEET AL 455305, COND. A FINISH
E/N/1/54 28 PER QD-J-766

USED ON
405762

REVISIONS



030041018

| CATALYST RESEARCH CORPORATION BALTIMORE, MARYLAND 21209 U.S.A. | DIMENSIONS IN INCHES (UNLESS OTHERWISE SPECIFIED) | | DR. CH'K'D | SCALE 1/16 | J-3/F J-20-74 APP'D | DWG. SIZE |
|--|--|---------------------------|----------------------------|---------------|------------------------|--------------|
| | TOLERANCES (UNLESS OTHERWISE SPECIFIED) | | | | | |
| INTERPRET DIMENSIONS AND SYMBOLS IN ACCORDANCE WITH USAI-Y 14.5 | DECIMALS $\pm .005$ | FRACTIONS $\pm 1/64$ | DO NOT SCALE DRAWING | APP'D | APP'D | PART NO. |
| | | ANGLES $\pm 1/2^\circ$ | | | | 405762 |

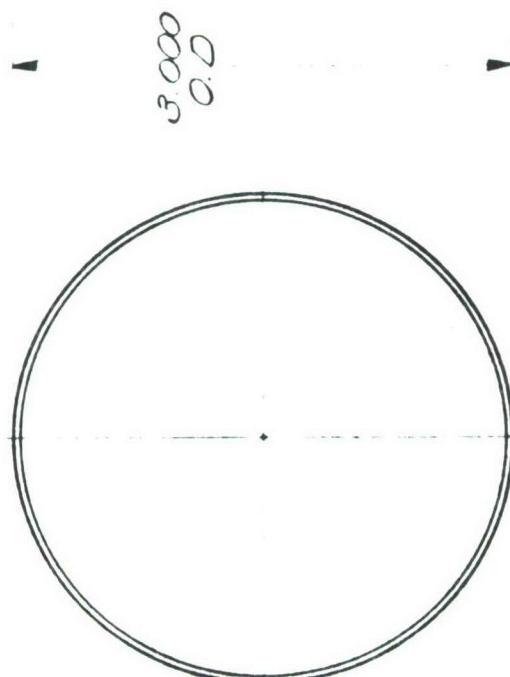
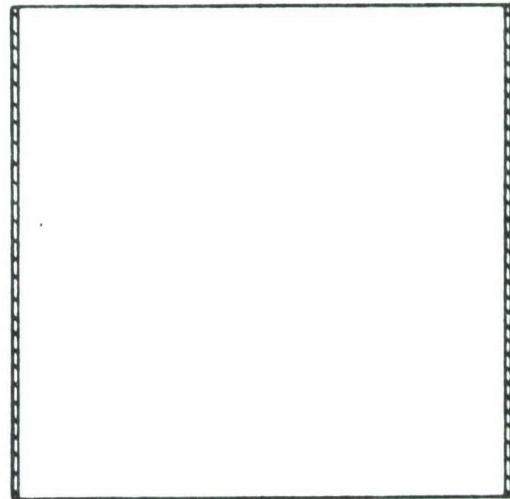
MATERIAL 032403 THICK STEEL CARBON SHEET
CROQUET PEE RD-5-673

USED ON
405765

NOTES

1. COULD NOT GET A DRAWING OF THIS
CIRCLE

| |
|-----------|
| REVISIONS |
| |
| |
| |
| |



030041021

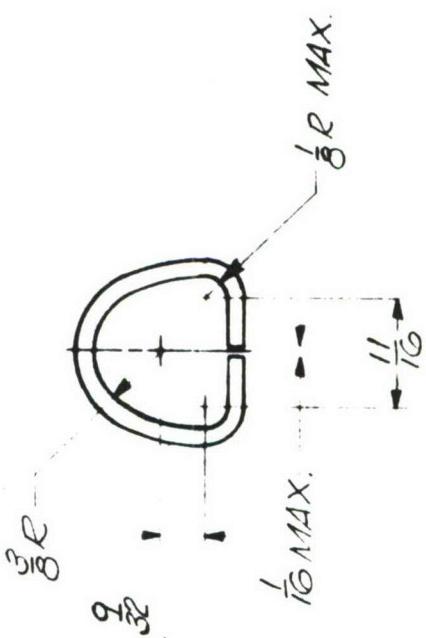
.000 $\pm .005$

| CATALYST RESEARCH CORPORATION BALTIMORE, MARYLAND 21209 U.S.A. | DIMENSIONS IN INCHES (UNLESS OTHERWISE SPECIFIED) | | DWG. SIZE | C45E 34775RY |
|--|--|----------------------------|--------------|--------------------|
| | SCALE 1/16 | DR. 1/16 5-17-32 CH'K'D | | |
| INTERPRET DIMENSIONS AND SYMBOLS IN ACCORDANCE WITH U.S.A.S.Y. 14.5 | DO NOT SCALE DRAWING | APP'D | APP'D | PART NO. 405765 |

| | | | |
|----------|---|--------|--|
| MATERIAL | 12GA (.105) WIRE, STEEL, CARBON, 100, BARE, DEP QQ-W-2G/ | FINISH | |
|----------|---|--------|--|

USED ON
4003763

REVISIONS



03004109

DULC

PART NO.

D

4003763

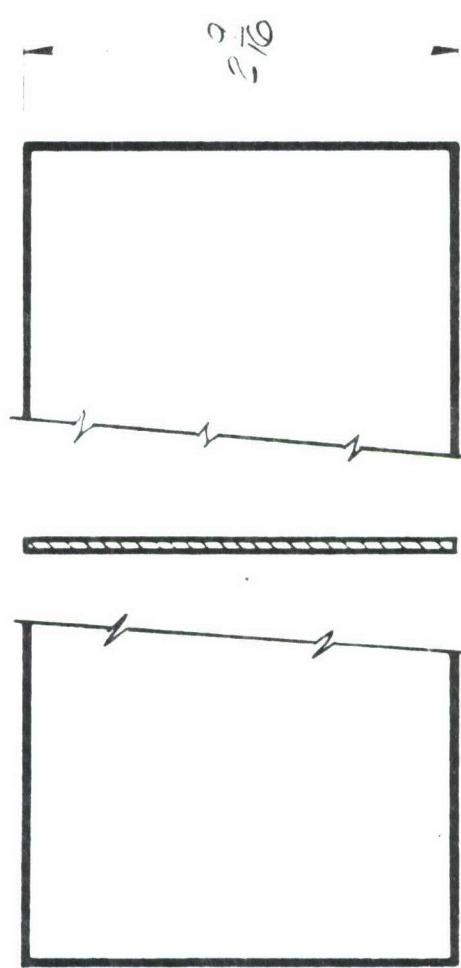
| CATALYST RESEARCH CORPORATION BALTIMORE, MARYLAND 21209 U.S.A. | DIMENSIONS IN INCHES (UNLESS OTHERWISE SPECIFIED) | | DR. USE IF 20-PC | DWG. SIZE |
|--|--|--|---------------------|--------------|
| | SCALE | TOLERANCES (BILLES OTHERWISE SPECIFIED) | | |
| INTERPRET DIMENSIONS AND SYMBOLS IN ACCORDANCE WITH ASA-SI-Y 14.5 | DECIMALS | DO NOT SCALE DRAWING | CH'K'D | |
| | FRACTIONS | APP'D | APP'D | |
| | ANGLES | APP'D | APP'D | |

MATERIAL 080 THICK FIBREGLASS SHEET
REF 500/77

FINISH

USED ON
203763

REVISIONS



030041016

INVENTOR
RECTANGLE

PART
NO.

D

4055759

| DIMENSIONS IN INCHES (UNLESS OTHERWISE SPECIFIED) | SCALE 1/16 | DR. 1/16 | CMK'D | DWG. SIZE |
|--|----------------------------|-------------|-------|--------------|
| TOLERANCES (UNLESS OTHERWISE SPECIFIED) | | | APP'D | |
| DECIMALS | DO NOT SCALE DRAWING | APP'D | APP'D | |
| FRACTIONS | | | APP'D | |
| ANGLES | | | APP'D | |

| | |
|---|---|
| CATALYST RESEARCH CORPORATION BALTIMORE, MARYLAND 21209 U.S.A. | INTERPRET DIMENSIONS AND SYMBOLS IN ACCORDANCE WITH USASI-Y 14.5 |
|---|---|

| | | | | | | | |
|---|--|--|-----------------|----------------------------|--------|-----------|--------------|
| MATERIAL | | 080 THICK FIBERFRAX SHEET | | FINISH | | USED ON | 403762 |
| | | | | | | REVISIONS | |
| <p>2 7/8 DIA</p> | | | | | | | |
| CATALYST RESEARCH CORPORATION | | DIMENSIONS IN INCHES (UNLESS OTHERWISE SPECIFIED) | | SCALE | DR. | 1/2 | DWG. SIZE |
| BALTIMORE, MARYLAND 21209 U.S.A. | | TOLERANCES (UNLESS OTHERWISE SPECIFIED) | | --- | CH'K'D | --- | --- |
| INTERPRET DIMENSIONS AND SYMBOLS IN ACCORDANCE WITH USASI-Y 14.5 | | DECIMALS | $\pm .005$ | DO NOT SCALE DRAWING | APP'D | APP'D | D |
| | | FRACTIONS | $\pm 1/64$ | | APP'D | APP'D | PART NO. |
| | | ANGLES | $\pm 1/2^\circ$ | | APP'D | APP'D | 405753 |
| 030041015 NOV/14/85 | | | | | | | |

| MATERIAL A FIN/CH 25 PER P.P.-S-726 | USED ON 403762 | REVISIONS | | | | | | | | | | | | | | | | | | | | | | | | |
|---|-----------------------|--|---------------------|--|-----------------------|-----|------|--------------|------|--------------|--------|--------|--------|--------|----------------------------|--|-------|-------|-------|-------|--------------------|--------------------|--------------------|---------------------|---------------------|------------------|
| | FINISH | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 030041017 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CATALYST RESEARCH CORPORATION BALTIMORE, MARYLAND 21209 U.S.A. INTERPRET DIMENSIONS AND SYMBOLS IN ACCORDANCE WITH ASA-S-Y 14.5 | | 030041017 CL/P <table border="1"> <thead> <tr> <th rowspan="2">DIMENSIONS IN INCHES (UNLESS OTHERWISE SPECIFIED)</th> <th rowspan="2">SCALE//.....</th> <th>DR.</th> <th>UF</th> <th>WF</th> <th>2D-X</th> <th>DWG. SIZE</th> </tr> <tr> <th>CH'K'D</th> <th>CH'K'D</th> <th>CH'K'D</th> <th>CH'K'D</th> </tr> </thead> <tbody> <tr> <td colspan="2">DO NOT SCALE DRAWING</td> <td>APP'D</td> <td>APP'D</td> <td>APP'D</td> <td>APP'D</td> </tr> <tr> <td>DECIMALS ± .005</td> <td>DECIMALS ± .005</td> <td>DECIMALS ± .005</td> <td>FRACTIONS ± 1/64</td> <td>FRACTIONS ± 1/64</td> <td>ANGLES ± 1/2°</td> </tr> </tbody> </table> | | DIMENSIONS IN INCHES (UNLESS OTHERWISE SPECIFIED) | SCALE//..... | DR. | UF | WF | 2D-X | DWG. SIZE | CH'K'D | CH'K'D | CH'K'D | CH'K'D | DO NOT SCALE DRAWING | | APP'D | APP'D | APP'D | APP'D | DECIMALS ± .005 | DECIMALS ± .005 | DECIMALS ± .005 | FRACTIONS ± 1/64 | FRACTIONS ± 1/64 | ANGLES ± 1/2° |
| DIMENSIONS IN INCHES (UNLESS OTHERWISE SPECIFIED) | SCALE//..... | DR. | UF | | | WF | 2D-X | DWG. SIZE | | | | | | | | | | | | | | | | | | |
| | | CH'K'D | CH'K'D | CH'K'D | CH'K'D | | | | | | | | | | | | | | | | | | | | | |
| DO NOT SCALE DRAWING | | APP'D | APP'D | APP'D | APP'D | | | | | | | | | | | | | | | | | | | | | |
| DECIMALS ± .005 | DECIMALS ± .005 | DECIMALS ± .005 | FRACTIONS ± 1/64 | FRACTIONS ± 1/64 | ANGLES ± 1/2° | | | | | | | | | | | | | | | | | | | | | |

| | | | | |
|---|----------------------|--|----------------|------------------|
| | | USED ON 405775 | | |
| | | REVISIONS | | |
| MATERIAL 1060 DIA. STEEL BAR, CARBON, COO'D FINISHED PER QQ-S-G3Z | FINISH 1.875-.000 | | | 0300041030 |
| | | SCALE 21----- DR. 13/16 5-1/2 | DWG. CH'K'D | PART NO. D |
| | | DO NOT SCALE DRAWING | | |
| | | INTERPRET DIMENSIONS AND SYMBOLS IN ACCORDANCE WITH USASI-Y 14.5 | | |
| | | CATALYST RESEARCH CORPORATION BALTIMORE, MARYLAND 21209 U.S.A. | | |
| | | DIMENSIONS IN INCHES (UNLESS OTHERWISE SPECIFIED) TOLERANCES (UNLESS OTHERWISE SPECIFIED) | | |
| | | DECIMALS $\pm .003$ FRACTIONS $\pm 1/64$ ANGLES $\pm 1/2^\circ$ | | |
| | | APP'D APP'D APP'D | | |

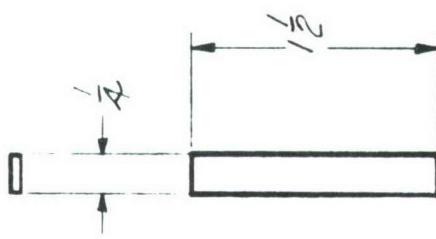
| | | | | | | |
|----------------------------------|----------------------------------|--|--------------------|--------------------|---------------|--------------|
| MATERIAL | '106 DIA STEEL BAR, CARBON, COLO | | FINISH | USED ON 4037761 | REVISIONS | 030041031 |
| | FINISHED PER QQ-J-634 | | | | | |
| | | | | | | |
| CATALYST RESEARCH CORPORATION | | DIMENSIONS IN INCHES (UNLESS OTHERWISE SPECIFIED) | SCALE 2/1 | DR. | U.S.F 5-A5-7X | DWG. SIZE |
| BALTIMORE, MARYLAND 21208 U.S.A. | | TOLERANCES (UNLESS OTHERWISE SPECIFIED) | | CH'K'D | | P/N |
| | | DECIMALS | $\pm .005$ | APP'D | | |
| | | FRACTIONS | $\pm \frac{1}{64}$ | APP'D | | |
| | | ANGLES | $\pm 1/2^\circ$ | APP'D | D | PART NO. |
| | | INTERPRET DIMENSIONS AND SYMBOLS IN ACCORDANCE WITH USAF-14.5 | | | | 405776 |

MATERIAL
PER

FINISH

USED ON
405777

REVISIONS



030041032

| CATALYST RESEARCH CORPORATION | | DIMENSIONS IN INCHES (UNLESS OTHERWISE SPECIFIED) | SCALE - $\frac{1}{16}$ | DR. | $\sqrt{3}/4$ | $5^{\circ} 22' 30''$ | DWG. SIZE | INVENTOR RECTANGLE |
|---|--|--|------------------------|----------------------------|--------------|----------------------|--------------|-----------------------|
| BALTIMORE, MARYLAND 21209 U.S.A. | | TOLERANCES (UNLESS OTHERWISE SPECIFIED) | | CH'K'D | | | | |
| INTERPRET DIMENSIONS AND SYMBOLS IN ACCORDANCE WITH U.S.A.S.I.Y 14.5 | | DECIMALS FRACTIONS ANGLES | $\pm .005$ | DO NOT SCALE DRAWING | APP'D | | D | PART NO. 405777 |
| | | | $\pm 1/64$ | | APP'D | | | |
| | | | $\pm 1/2^{\circ}$ | | APP'D | | | |

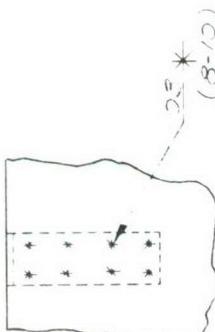
| MATERIAL REINFORCED CONCRETE | USED ON 403783 | REVISES | | | | | | | | | | | | | | | | | | | | |
|---|--|---------|--------------|---|--|--|--------------|-----|--------|--|----------------------------|--|-------|--------------------|--|-------|---------------------|--|-------|------------------|--|-------|
| | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | |
| <p style="text-align: right;">030041038</p> | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1"> <thead> <tr> <th rowspan="2">CATALYST RESEARCH CORPORATION BALTIMORE, MARYLAND 21209 U.S.A.</th> <th colspan="2">DIMENSIONS IN INCHES (UNLESS OTHERWISE SPECIFIED)</th> <th rowspan="2">DWG. SIZE</th> </tr> <tr> <th>DR.</th> <th>CH'K'D</th> </tr> </thead> <tbody> <tr> <td rowspan="3">INTERPRET DIMENSIONS AND SYMBOLS IN ACCORDANCE WITH USAASI-Y 14.5</td> <td colspan="2">DO NOT SCALE DRAWING</td> <td>APP'D</td> </tr> <tr> <td colspan="2">DECIMALS ± .005</td> <td>APP'D</td> </tr> <tr> <td colspan="2">FRACTIONS ± 1/64</td> <td>APP'D</td> </tr> <tr> <td colspan="2">ANGLES ± 1/2°</td> <td>APP'D</td> </tr> </tbody> </table> | | | | CATALYST RESEARCH CORPORATION BALTIMORE, MARYLAND 21209 U.S.A. | DIMENSIONS IN INCHES (UNLESS OTHERWISE SPECIFIED) | | DWG. SIZE | DR. | CH'K'D | INTERPRET DIMENSIONS AND SYMBOLS IN ACCORDANCE WITH USAASI-Y 14.5 | DO NOT SCALE DRAWING | | APP'D | DECIMALS ± .005 | | APP'D | FRACTIONS ± 1/64 | | APP'D | ANGLES ± 1/2° | | APP'D |
| CATALYST RESEARCH CORPORATION BALTIMORE, MARYLAND 21209 U.S.A. | DIMENSIONS IN INCHES (UNLESS OTHERWISE SPECIFIED) | | DWG. SIZE | | | | | | | | | | | | | | | | | | | |
| | DR. | CH'K'D | | | | | | | | | | | | | | | | | | | | |
| INTERPRET DIMENSIONS AND SYMBOLS IN ACCORDANCE WITH USAASI-Y 14.5 | DO NOT SCALE DRAWING | | APP'D | | | | | | | | | | | | | | | | | | | |
| | DECIMALS ± .005 | | APP'D | | | | | | | | | | | | | | | | | | | |
| | FRACTIONS ± 1/64 | | APP'D | | | | | | | | | | | | | | | | | | | |
| ANGLES ± 1/2° | | APP'D | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--------|--|----------------------------|--|-------------------------------|--|--|---------------|---------------|--------------|----------------------------------|--|--|----------------------------|-------|-------|---|--|------------------------|-------------------------|-------|-------|--|--|---------------------------|--|--|--|
| MATERIAL 040 THICK FIBERFAX SHEET | FINISH | | REVISIONS | USED ON 403731 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | 030041029 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | <table border="1"> <tr> <td colspan="2">CATALYST RESEARCH CORPORATION</td> <td>DIMENSIONS IN INCHES (UNLESS OTHERWISE SPECIFIED)</td> <td>SCALE 1/16</td> <td>DR. CH'K'D</td> <td>DWG. SIZE</td> </tr> <tr> <td colspan="2">BALTIMORE, MARYLAND 21209 U.S.A.</td> <td>TOLERANCES (UNLESS OTHERWISE SPECIFIED)</td> <td>DO NOT SCALE DRAWING</td> <td>APP'D</td> <td>APP'D</td> </tr> <tr> <td colspan="2">INTERPRET DIMENSIONS AND SYMBOLS IN ACCORDANCE WITH USASI-Y 14.5</td> <td>DECIMALS $\pm .005$</td> <td>FRACTIONS $\pm 1/64$</td> <td>APP'D</td> <td>APP'D</td> </tr> <tr> <td colspan="2"></td> <td>ANGLES $\pm 1/2^\circ$</td> <td></td> <td></td> <td></td> </tr> </table> <p>030041029 //MOSULATOR RECTANGLE D PART NO. 405774</p> | CATALYST RESEARCH CORPORATION | | DIMENSIONS IN INCHES (UNLESS OTHERWISE SPECIFIED) | SCALE 1/16 | DR. CH'K'D | DWG. SIZE | BALTIMORE, MARYLAND 21209 U.S.A. | | TOLERANCES (UNLESS OTHERWISE SPECIFIED) | DO NOT SCALE DRAWING | APP'D | APP'D | INTERPRET DIMENSIONS AND SYMBOLS IN ACCORDANCE WITH USASI-Y 14.5 | | DECIMALS $\pm .005$ | FRACTIONS $\pm 1/64$ | APP'D | APP'D | | | ANGLES $\pm 1/2^\circ$ | | | |
| CATALYST RESEARCH CORPORATION | | DIMENSIONS IN INCHES (UNLESS OTHERWISE SPECIFIED) | SCALE 1/16 | DR. CH'K'D | DWG. SIZE | | | | | | | | | | | | | | | | | | | | | | | |
| BALTIMORE, MARYLAND 21209 U.S.A. | | TOLERANCES (UNLESS OTHERWISE SPECIFIED) | DO NOT SCALE DRAWING | APP'D | APP'D | | | | | | | | | | | | | | | | | | | | | | | |
| INTERPRET DIMENSIONS AND SYMBOLS IN ACCORDANCE WITH USASI-Y 14.5 | | DECIMALS $\pm .005$ | FRACTIONS $\pm 1/64$ | APP'D | APP'D | | | | | | | | | | | | | | | | | | | | | | | |
| | | ANGLES $\pm 1/2^\circ$ | | | | | | | | | | | | | | | | | | | | | | | | | | |

| MATERIAL | FINISH | TOOL NO. | DESCRIPTION | REQ'D. |
|----------|--------|----------|----------------|--------|
| | | | CHERNOV | - |
| | | 405768 | MOULDER D.I.C. | - |
| | | 405769 | MOULDER PECT. | - |
| | | 405761 | C.L.P | - |
| | | 405762 | HINGE | - |
| | | 405763 | PULL | - |

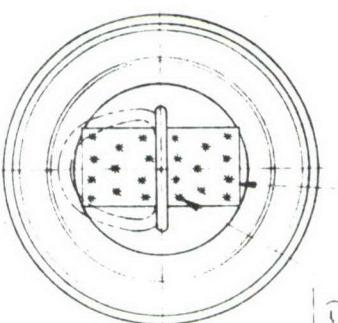
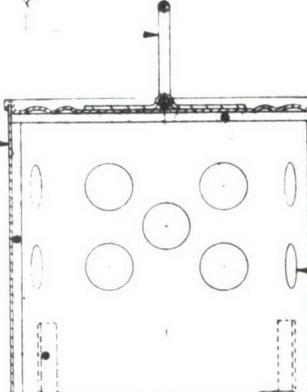
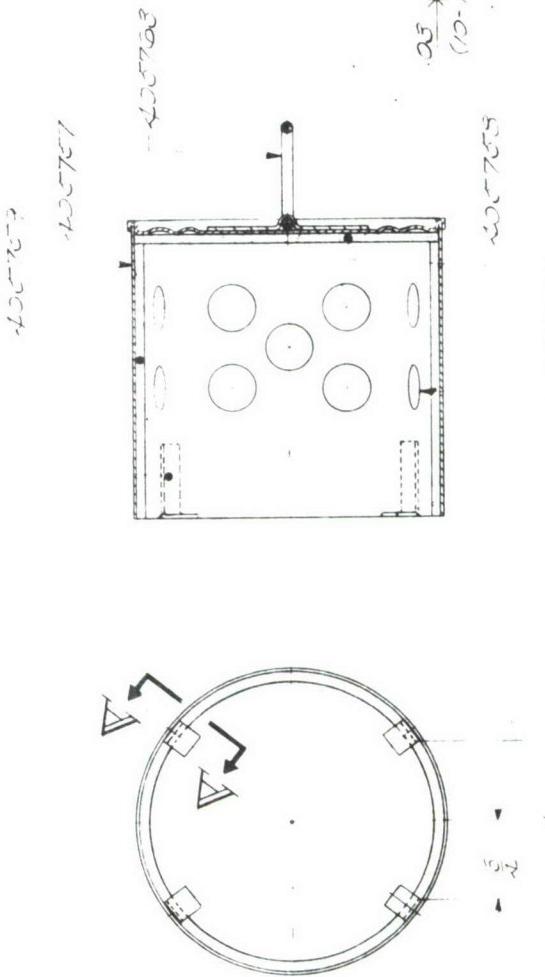
NOTE: BUNCH HOUSE IN JORDAN
WALL ROCKWATER AFTER 1955
(SHARPOUD ACTS AS A TERRACATE)

NOTE



A diagram showing a rectangular frame with diagonal hatching across its top and right-hand side edges.

SECTION V A-A'



/ ALICE

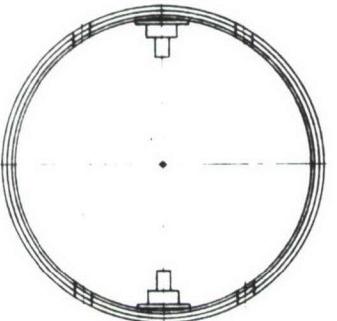
030041020

| | | | |
|--|------------|----------------------------|---------------|
| CATALYST RESEARCH CORPORATION | | APP'D | DWG. SIZE |
| BALTIMORE, MARYLAND 21209 U.S.A. | | CH/WD | |
| INTERPRET DIMENSIONS AND SYMBOLS IN ACCORDANCE WITH U.S.A.I.Y. 14.8 | | DO NOT SCALE DRAWING | C PART NO. |
| UNLESS OTHERWISE SPECIFIED | TOLERANCES | APP'D | 405764 |
| UNLESS OTHERWISE SPECIFIED | DECIMALS | APP'D | |
| | FRACTIONS | APP'D | |
| | ANGLES | APP'D | |
| | | 1/64 | |
| | | 1/2" | |

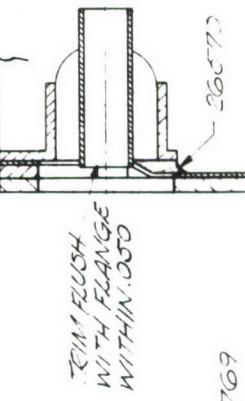
| MATERIAL | FINISH | PART NO. | TOOL NO. | DESCRIPTION | REQ'D. | USED ON 405782 |
|----------|--------|----------|----------|-------------|--------|-------------------|
| | | | | | | REVISIONS |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

NOTE:

- 1) MACHIN TERMINAL SEAM AS SHOWN
BEFORE TO BREAKAWAY
- 2) TERMINAL SEAM AND "EX" GEAR
WELDED DOWN TO BEARING
(OPTIONAL)
- 3) SIZE IN ACCORDANCE TO MC-B-3333

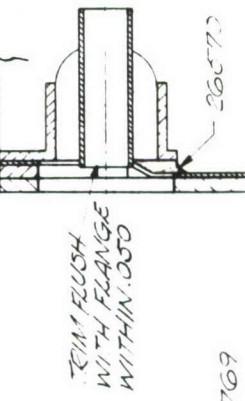


SEE DETAIL A



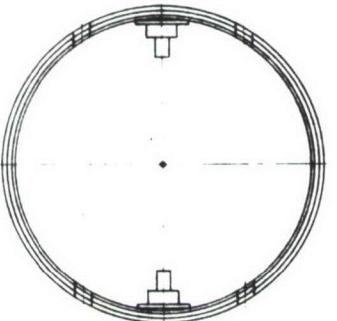
DETAIL A

SCALE 1/1

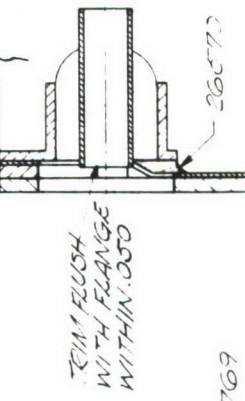


SCALE 1/1

DETAIL A



SEE DETAIL A

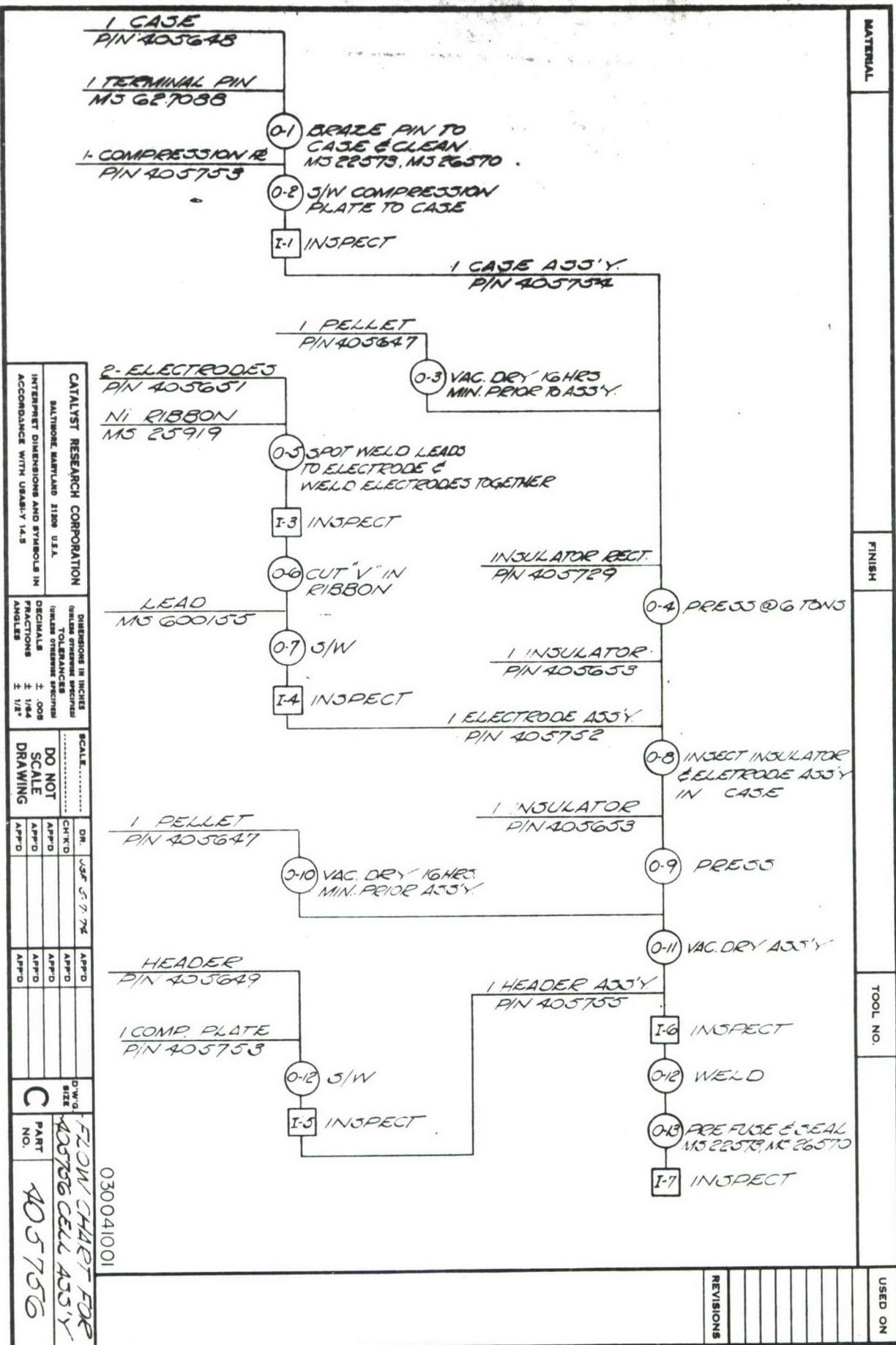


DETAIL A

SCALE 1/1

| | | | | | | |
|---|--|----------------------------|----------------|----------------|------------------------|--|
| CATALYST RESEARCH CORPORATION BALTIMORE, MARYLAND 21209 U.S.A. INTERPRET DIMENSIONS AND SYMBOLS IN ACCORDANCE WITH ASA Y14.5 | DIMENSIONS IN INCHES (UNLESS OTHERWISE SPECIFIED) TOLERANCES (UNLESS OTHERWISE SPECIFIED) | SCALE 1/1 | DR. CH X D | APP'D APP'D | DWG SIZE C | 030041026 <i>ATTACH CAVE ASSEMBLY</i> |
| | DECIMALS $\pm .005$ | DO NOT SCALE DRAWING | APP'D APP'D | APP'D APP'D | PART NO. 4057771 | |
| | FRACTIONS $\pm 1/64$ | | | | | |
| | ANGLES $\pm 1/2^\circ$ | | | | | |

| MATERIAL | FINISH | TOOL NO. | DESCRIPTION | REQ'D. | USED ON | | | | | | | | | | | | | | | | |
|--|-----------------------|----------|-------------|--------|---------|----------|---------------------|--------|---|--|-------------------|--|---|--|-----------------------|--|---|--|--------------|--|---|
| | | | | | 405777 | | | | | | | | | | | | | | | | |
| REVISIONS | | | | | | | | | | | | | | | | | | | | | |
| <table border="1"> <tr> <td>PART NO.</td> <td>405765 CASE BATTERY</td> <td>REQ'D.</td> <td>-</td> </tr> <tr> <td></td> <td>405766 CASE PLATE</td> <td></td> <td>-</td> </tr> <tr> <td></td> <td>405767 MOUNTING PLATE</td> <td></td> <td>-</td> </tr> <tr> <td></td> <td>405768 LATCH</td> <td></td> <td>-</td> </tr> </table> | | | | | | PART NO. | 405765 CASE BATTERY | REQ'D. | - | | 405766 CASE PLATE | | - | | 405767 MOUNTING PLATE | | - | | 405768 LATCH | | - |
| PART NO. | 405765 CASE BATTERY | REQ'D. | - | | | | | | | | | | | | | | | | | | |
| | 405766 CASE PLATE | | - | | | | | | | | | | | | | | | | | | |
| | 405767 MOUNTING PLATE | | - | | | | | | | | | | | | | | | | | | |
| | 405768 LATCH | | - | | | | | | | | | | | | | | | | | | |
| <p><u>NOTE</u></p> <p>1. FUSION WELD TO THE CASE NUMBER</p> | | | | | | | | | | | | | | | | | | | | | |
| <p><u>DETAIL A</u></p> <p>SCALe $\frac{1}{4}$</p> <p>$\Phi \frac{3}{2} \pm .005$ Dia Hole</p> <p>$\Phi .100$ Dia</p> <p>THRU BOTH WALLS</p> <p>1.500</p> <p>.157</p> <p>.100</p> <p>* PLACE E5</p> <p><u>NOTE</u></p> <p>405765</p> <p>405766</p> <p>405767</p> <p>405768</p> | | | | | | | | | | | | | | | | | | | | | |
| <p><u>NOTE</u></p> <p>SEE DETAIL A</p> | | | | | | | | | | | | | | | | | | | | | |
| <p><u>NOTE</u></p> <p>(75-80)</p> <p>(TYPICAL)</p> <p>405765</p> <p>405766</p> <p>405767</p> <p>405768</p> | | | | | | | | | | | | | | | | | | | | | |



CATALYST RESEARCH CORPORATION
BALTIMORE, MARYLAND 21209 U.S.A.
INTERPRET DIMENSIONS AND SYMBOLS IN ACCORDANCE WITH U.S.A.Y. 14.9

| CATALYST | | RESEARCH CORPORATION | |
|--|------------|----------------------|-----------------|
| DIMENSIONS IN INCHES (UNLESS OTHERWISE SPECIFIED) | SCALE..... | DR. | USAF 5.7.7.7.7. |
| TOLERANCES (UNLESS OTHERWISE SPECIFIED) | | CHX-KD | APP'D |
| DECIMALS FRACTIONS | | APP'D | APP'D |
| ± .004 | | APP'D | APP'D |
| ± 1/64 | | APP'D | APP'D |
| ± 1/2" | | APP'D | APP'D |

| DRAWING | | DRAWING | | DRAWING | |
|---------------|-------|---------|-------|---------|-------|
| C | | | | | |
| C | | | | | |
| PART NO. | | | | | |
| 405756 | | | | | |

030041001

FLOW CHART FOR

HEADER
P/N 405649

COMP. PLATE
P/N 405753

0-10 S/W

I-5 I-INSPECT

1 HEADER ASS'Y
P/N 405755

I-6 I-INSPECT

0-12 WELD

0-13 PRE FUSE & SEAL
M5 22573, M5 26570

I-7 I-INSPECT

REVISIONS

1 PELLET
P/N 405647

0-10 VAC. DRY 16 HRS
MIN. PRIOR ASS'Y

1 INSULATOR
P/N 405655

0-8 INJECT INSULATOR
ELECTRODE ASS'Y
IN CASE

0-9 PRESS

0-11 VAC. DRY ASS'Y

LEAD
M5 600155

0-7 S/W

I-4 I-INSPECT

INSULATOR RECT.
P/N 405729

0-4 PRESS @ 6 TONS

2 ELECTRODES
P/N 405651

NI RIBBON
M5 25919

0-5 SPOT WELD LEADS
TO ELECTRODE C
WELD ELECTRODES TOGETHER

I-3 I-INSPECT

0-6 CUT "V" IN
RIBBON

1 INSULATOR
P/N 405655

1 ELECTRODE ASS'Y
P/N 405752

1 CASE
P/N 405648

1 TERMINAL PIN
M5 GE7038

0-1 BRAZE PIN TO
CASE & CLEAN
M5 22573, M5 26570

0-2 S/W COMPRESSION
PLATE TO CASE

I-1 I-INSPECT

1 CASE ASS'Y
P/N 405754

0-3 VAC. DRY 16 HRS
MIN. PRIOR TO ASS'Y

1 INSULATOR
P/N 405655

1 ELECTRODE ASS'Y
P/N 405752

0-8 INJECT INSULATOR
ELECTRODE ASS'Y
IN CASE

0-9 PRESS

0-11 VAC. DRY ASS'Y

1 INSULATOR
P/N 405655

1 ELECTRODE ASS'Y
P/N 405752

0-8 INJECT INSULATOR
ELECTRODE ASS'Y
IN CASE

0-9 PRESS

0-11 VAC. DRY ASS'Y

1 INSULATOR
P/N 405655

1 ELECTRODE ASS'Y
P/N 405752

0-8 INJECT INSULATOR
ELECTRODE ASS'Y
IN CASE

0-9 PRESS

0-11 VAC. DRY ASS'Y

1 INSULATOR
P/N 405655

1 ELECTRODE ASS'Y
P/N 405752

0-8 INJECT INSULATOR
ELECTRODE ASS'Y
IN CASE

0-9 PRESS

0-11 VAC. DRY ASS'Y

1 INSULATOR
P/N 405655

1 ELECTRODE ASS'Y
P/N 405752

0-8 INJECT INSULATOR
ELECTRODE ASS'Y
IN CASE

0-9 PRESS

0-11 VAC. DRY ASS'Y

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P/N 405752

0-8 INJECT INSULATOR
ELECTRODE ASS'Y
IN CASE

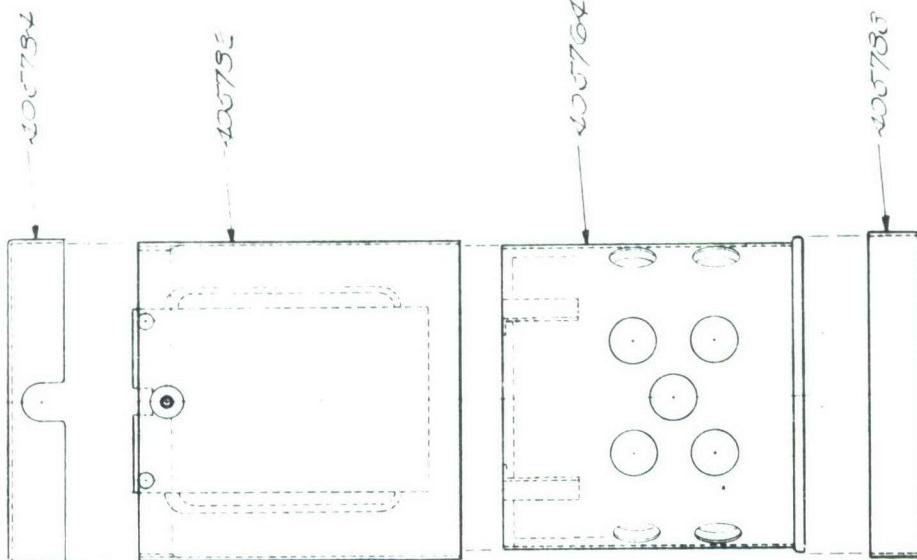
0-9 PRESS

0-11 VAC. DRY ASS'Y

1 INSULATOR
P/N 405655

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400711855 (400711855) 400711855

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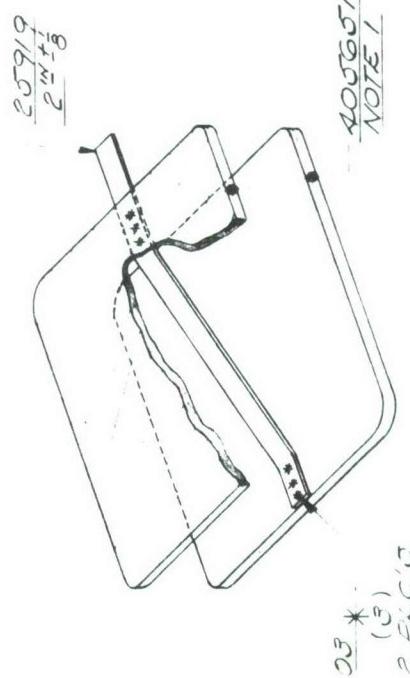
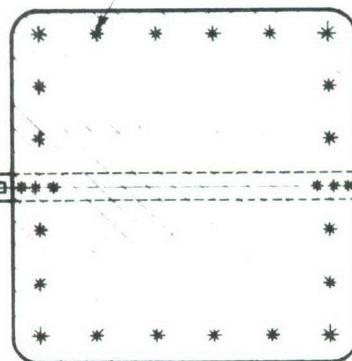
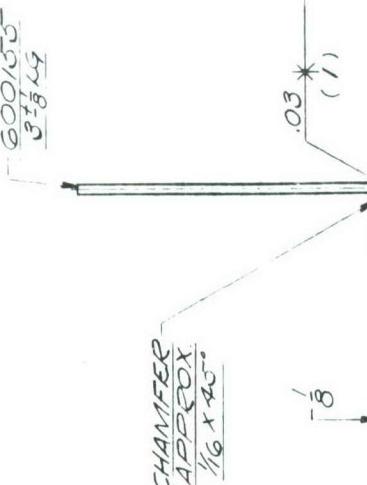
PACKAGED UNIT

| | | | |
|---|--|--|--------------------|
| CATALYST RESEARCH CORPORATION | | DR. 5-50-24 | APP'D |
| BALTIMORE, MARYLAND 21208 U.S.A. | | CHY'D | APP'D |
| INTERIM DIMENSIONS AND SYMBOLS IN ACCORDANCE WITH USA: Y 1.5 | | DO NOT SCALE FRACTIONS ANGLES | APP'D |
| DIMENSIONS IN INCHES (UNLESS OTHERWISE SPECIFIED IN DRAWING) UNLESS OTHERWISE SPECIFIED IN DRAWING) | | ± 0.05 ± 1/84 ± 1/84 | APP'D |
| DIMENSIONS IN MILLIMETERS (UNLESS OTHERWISE SPECIFIED IN DRAWING) UNLESS OTHERWISE SPECIFIED IN DRAWING) | | ± 0.05 ± 1/84 ± 1/84 | APP'D |
| DIMENSIONS IN MILLIMETERS (UNLESS OTHERWISE SPECIFIED IN DRAWING) UNLESS OTHERWISE SPECIFIED IN DRAWING) | | ± 0.05 ± 1/84 ± 1/84 | APP'D |
| | | | C |
| | | | PART NO. A00577 |

| MATERIAL | FINISH | TOOL NO. | USED ON 405756 | |
|----------|--------|----------|-------------------|--------|
| | | PART NO. | DESCRIPTION | REQ'D. |
| | | 405607 | ELECTRODE | 2 |
| | | 25919 | LEAD | 2 1/8" |
| | | 20055 | LEAD | 3 1/8" |

REVISIONS

NOTE:

1 CANCELLED DUE TO BOTH
ELECTRODES FACE OUT

25919
 $\frac{1}{8}$ "

DO NOT
NOTE 1

FLAT LEAD ASSEMBLY

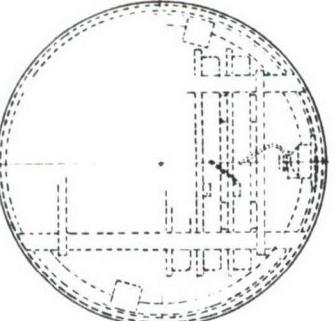
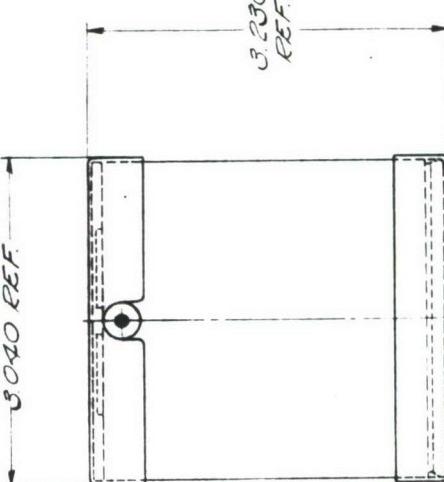
1660 255

| CATALYST RESEARCH CORPORATION BALTIMORE, MARYLAND 21208 U.S.A. INTERPRET DIMENSIONS AND SYMBOLS IN ACCORDANCE WITH U.S.A.Y 14.5 DIMENSIONS IN INCHES (UNLESS OTHERWISE SPECIFIED) TOLERANCES (UNLESS OTHERWISE SPECIFIED) | SCALE ... 1/16 | DR. CHKD | UF APP'D | UF APP'D | UF APP'D | UF APP'D | UF APP'D | UF APP'D |
|--|----------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| DECIMALS ± .005 | DO NOT SCALE | | | | | | | |
| FRACTIONS ± 1/64 | DRAWING | | | | | | | |
| ANGLES | 1/2° | | | | | | | |

030041009

ELECTRODE
ASSEMBLY

C PART
NO. 405752

| MATERIAL | FINISH | TOOL NO. | USED ON | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|------------------------|----------------------|---|--|--|--|---------------|------------------------|----------------------|----------------------------|--|--|--|--------------------|------|------|------|---------------------|------|------|------|------------------|------|------|------|
| | | | REVISION A | | | | | | | | | | | | | | | | | | | | | | | |
| <p>NOTE U:</p> <ol style="list-style-type: none"> 1 FOR BATTERY ASSEMBLY SEE ONE SIDE 2 FOR TEST REQUIREMENTS SEE TR | | | | | | | | | | | | | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>030041000 BATTER Y PART NO. 405700 C PART NO. 405700</p> | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1"> <tr> <td rowspan="2">CATALYST RESEARCH CORPORATION BALTIMORE, MARYLAND 21208 U.S.A. INTERPRET DIMENSIONS AND SYMBOLS IN ACCORDANCE WITH USABLY 14.5</td> <td colspan="3">DIMENSIONS IN INCHES (EXCEPT WHERE SPECIFIED IN MILLIMETERS)</td> </tr> <tr> <td>SCALE 1/16</td> <td>DR. CHAMFER APFD</td> <td>DIA. SIDE APFD</td> </tr> <tr> <td colspan="4">DO NOT SCALE DRAWING</td> </tr> <tr> <td>DECIMALS ± .005</td> <td>APFD</td> <td>APFD</td> <td>APFD</td> </tr> <tr> <td>FRACTIONS ± 1/64</td> <td>APFD</td> <td>APFD</td> <td>APFD</td> </tr> <tr> <td>ANGLES ± 1/2°</td> <td>APFD</td> <td>APFD</td> <td>APFD</td> </tr> </table> | | | | CATALYST RESEARCH CORPORATION BALTIMORE, MARYLAND 21208 U.S.A. INTERPRET DIMENSIONS AND SYMBOLS IN ACCORDANCE WITH USABLY 14.5 | DIMENSIONS IN INCHES (EXCEPT WHERE SPECIFIED IN MILLIMETERS) | | | SCALE 1/16 | DR. CHAMFER APFD | DIA. SIDE APFD | DO NOT SCALE DRAWING | | | | DECIMALS ± .005 | APFD | APFD | APFD | FRACTIONS ± 1/64 | APFD | APFD | APFD | ANGLES ± 1/2° | APFD | APFD | APFD |
| CATALYST RESEARCH CORPORATION BALTIMORE, MARYLAND 21208 U.S.A. INTERPRET DIMENSIONS AND SYMBOLS IN ACCORDANCE WITH USABLY 14.5 | DIMENSIONS IN INCHES (EXCEPT WHERE SPECIFIED IN MILLIMETERS) | | | | | | | | | | | | | | | | | | | | | | | | | |
| | SCALE 1/16 | DR. CHAMFER APFD | DIA. SIDE APFD | | | | | | | | | | | | | | | | | | | | | | | |
| DO NOT SCALE DRAWING | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DECIMALS ± .005 | APFD | APFD | APFD | | | | | | | | | | | | | | | | | | | | | | | |
| FRACTIONS ± 1/64 | APFD | APFD | APFD | | | | | | | | | | | | | | | | | | | | | | | |
| ANGLES ± 1/2° | APFD | APFD | APFD | | | | | | | | | | | | | | | | | | | | | | | |

| MATERIAL | FINISH | | | TOOL NO. | USED ON 405783 |
|-----------|--------|----------|---------------------|----------|-------------------|
| | | PART NO. | DESCRIPTION | | |
| | | 405771 | BATTERY CASE 435'Y. | 1 | |
| | | 405781 | CELL STACK ASSTY. | 1 | |
| | | 600305 | BOOKS WIRE | AR | |
| | | 60570 | WELDER SOLDER | AR | |
| | | 22575 | FLUX | AR | |
| REVISIONS | | | | | |

NOTES:

(+)

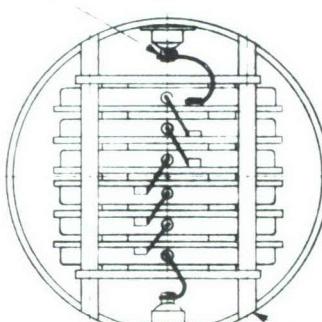
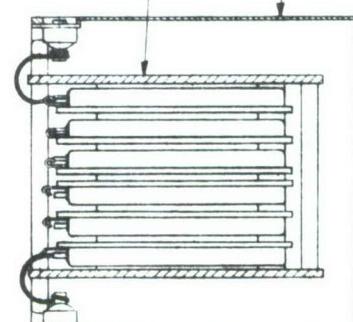
(-)

1. HEAT PIN OF STACK ASSTY.
INTO CASE NOTCH (CENTER
STACK WITH CASE) AND HELD IN
PLACE.

2. REMOVE EXCESS PIN LENGTHS
WITH CASE 3.0.

3. INCISE (BRAZE & MIG) LEAD
LEAD - ADJACENT TERMINALS;
BRAZE IN PLACE

4. BRAZE IN ACCORDANCE WITH MIL-B-7838

030041036

| CATALYST RESEARCH CORPORATION | | DIMENSIONS IN INCHES (UNLESS OTHERWISE SPECIFIED) | | SCALE 1/16, 1/32, 1/64, 1/128 | | DR. | | C.R.D. | | APP'D | | C.R.D. | | APP'D | |
|--|--|--|--|----------------------------------|--|--------|--|--------|--|--------|--|--------|--|----------------------|--|
| BALTIMORE, MARYLAND 21206 U.S.A. | | TOLERANCES (UNLESS OTHERWISE SPECIFIED) | | DO NOT SCALE DRAWING | | C.R.D. | | APP'D | | C.R.D. | | APP'D | | C.R.D. | |
| INTERPRET DIMENSIONS AND SYMBOLS IN ACCORDANCE WITH USAE 14.5 | | DECIMALS $\pm .005$ | | DO NOT SCALE DRAWING | | APP'D | | APP'D | | APP'D | | APP'D | | C PART NO. 405782 | |
| FRACTIONS $\pm \frac{1}{64}$ | | ANGLES $\pm \frac{1}{12}^{\circ}$ | | | | | | | | | | | | | |

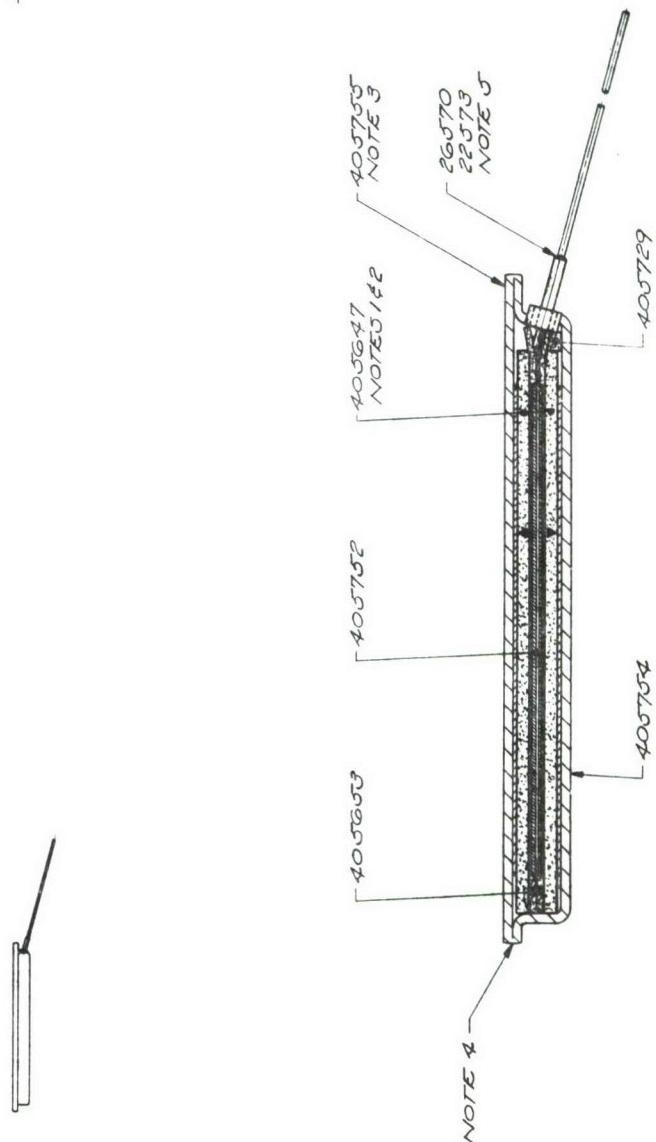
| MATERIAL | FINISH | TOOL NO. | USED ON | |
|----------|--------|----------|---------------------|-------|
| | | PART NO. | DESCRIPTION | REQ'D |
| | | 405747 | COLLECT ELECTRODE | 2 |
| | | 405749 | INSULATOR | 2 |
| | | 405750 | INDUCTION ELECTRODE | 1 |
| | | 405752 | ELECTRODE ADJ'ST | 1 |
| | | 405753 | CAP ADJ'ST | 1 |
| | | 405755 | COLLECT ADJ'ST | 1 |
| | | 225756 | FLUX | 1P |
| | | 225758 | SOLDER SNIFFER | 1P |

REVISIONS:

REVISIONS:

NOTES:

- 1 VACUUM DRY PELLETS AT 150°-160°
FOR 1 MIN. AT 1/111 OF MAX. AMP.
TO ADJUST
- 2 CONNECT BOTTOM PELLER INTO
CASE AT G TONE TOTAL FORCE
(NOTE:- PELLER SHALL HAVE
EXPANDED METAL SIDE FACING
IN DIRECTION OF ARROW HEAD)
- 3 VACUUM DRY 400% PRIOR TO
LOADING AND INSTRUCTIONS OF
NOTE 1
- 4 WELD COVER IN PLACE - HELI-ARC
WELD, NON CONDUCTABLE
ELECTRODE METHOD WITH MIG
GAS SHIELD ARC
- 5 PREPARE CELL BETWEEN 100°-120°
LOAD FOR 20-25 MINUTES.
APPROX 2 MINUTES AFTER REAK
LOAD VOLTAGE IS REACHED, SEAL
TERMINAL PAN AS SHOWN. REMOVE
FROM PLATTERS.



SECTION "A-A"

SCALE 1/1

0300-4103

CELL ADJ'ST

B PART NO. 205756

CATALYST RESEARCH CORPORATION
BALTIMORE, MARYLAND 21209 U.S.A.
INTERIM DIMENSIONS AND SPECIFICATIONS
ACCORDANCE WITH DRAWING 14-6

| | | | | |
|-------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| DIMENSIONS IN INCHES | INCHES | MM | INCHES | MM |
| WHICH EVER IS GREATER | WHICH EVER IS GREATER | WHICH EVER IS GREATER | WHICH EVER IS GREATER | WHICH EVER IS GREATER |
| TOLERANCES | 0.005 | 0.05 | 0.005 | 0.05 |
| WEIGHT OVERALL SPECIFICATIONS | DO NOT | DO NOT | DO NOT | DO NOT |
| INCHES | SCALE | DRAWING | SCALE | DRAWING |
| 2 | 1/16 | 1/16 | 1/16 | 1/16 |
| 2 | 1/8 | 1/8 | 1/8 | 1/8 |
| 2 | 1/4 | 1/4 | 1/4 | 1/4 |
| 2 | 1/2 | 1/2 | 1/2 | 1/2 |

APPENDIX B

OPERATING INSTRUCTIONS

OPERATING INSTRUCTIONS

This device is a reusable power supply intended to power the AN/PRC-77 radio for a period of 10 minutes.

The major parts of the supply are shown in Figure 1.

TO OPERATE

A. Preparation:

- (1) Remove sealing tape from around end caps (save for resealing).
- (2) Remove and save end caps.
- (3) With a slow, steady, straight motion separate the burner can from the battery can by pulling on the pull ring on the bottom of the burner can.
- (4) Load trioxane fuel into the burner can. Break each bar into 2 or 3 pieces as required. The amount of fuel to be used varies with the temperature and the number of times the device has been used. Table 1 provides the correct fuel loadings.

NOTE: Do not overload fuel as this will result in serious damage to the power supply.

Two Delrin tablets (interlocked in an X configuration) may be used as an alternate fuel supply when trioxane is not available.

- (5) Gently, insert the burner can with fuel into the battery can so that the triangular position indicator mark on the burner can aligns with the triangular mark on the battery can. (See Fig. 2). The lower end of the cell stack end plates will now rest on the cell stack support pads.

NOTE: Do not exert force on assembly as damage will result. Make certain support pads contact the cell stack support bracket and not the cells.

- (6) Plug leads into proper connector. The multipin jack (Power receptacle J4) is inserted in the radio. The miniature banana plug on the red wire is inserted in (+) terminal of the battery. The plug on the black wire is inserted in the (-) terminal of the battery.

NOTE: Improper connection of jacks may damage radio.

- (7) Place the power supply assembly on a level surface.
- (8) Completely shield assembly from wind.

B. Operation:

- (1) Ignite fuel through burner can vent window.
- (2) After ignition of fuel the radio operator should listen for receiving noise. Receiving noise should be heard approx. three minutes after fuel ignition. The noise indicates the supply is beginning to supply power (power is not sufficient to transmit). Two minutes after receiver noise is acquired the power supply will be able to supply transmission power.

CAUTION: Power supply parts become extremely hot after fuel ignition. Parts remain too hot to touch for 40 minutes.

- (3) When fuel is first ignited it will burn with a clear or blue flame. After several minutes the flame will turn yellow and go out. Immediately after the yellow flame goes out the top end cap must be placed over the battery can to prevent excessive heat loss.

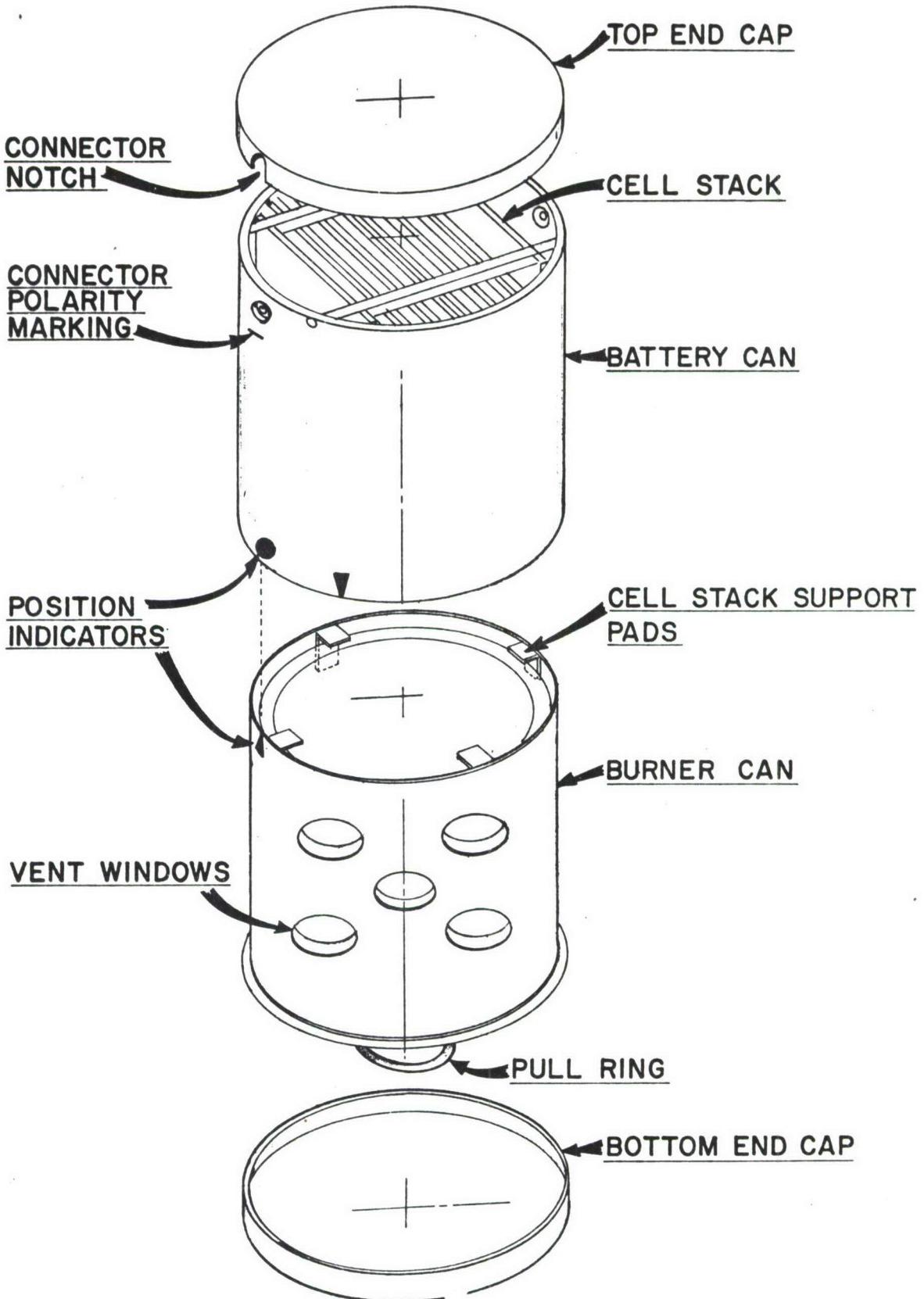
NOTE: Position top end cap so the connector notches align with connectors. Make sure cap does not touch connector pins as a short circuit will result.

C. Storage:

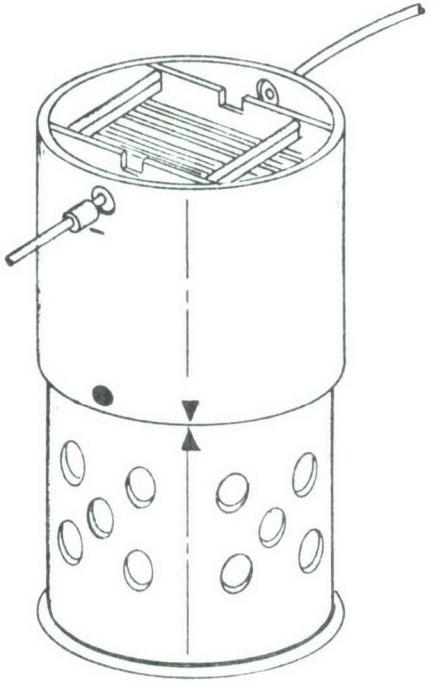
- (1) After use, the top end cap should be removed to allow power supply to cool down faster.
- (2) CAUTION: Cap is extremely hot.
- (3) No attempt should be made to handle assembly for a period of 40 minutes following ignition of fuel. After 40 minutes the assembly should be sufficiently cooled for closing. No attempt to add fuel should be made while the unit is hot. If unit is to be reused while still warm to the touch, column 3 of the fuel loading chart must be used.
- (3) To close assembly pull out burner can and align the triangle with the circular position mark on the battery can. (See Fig. 3.) Gently push cans together. Replace end caps and re-tape. Top end cap should be rotated so the connector notches do not align with connectors.

TABLE 1
Fuel Loading (Trioxyane)

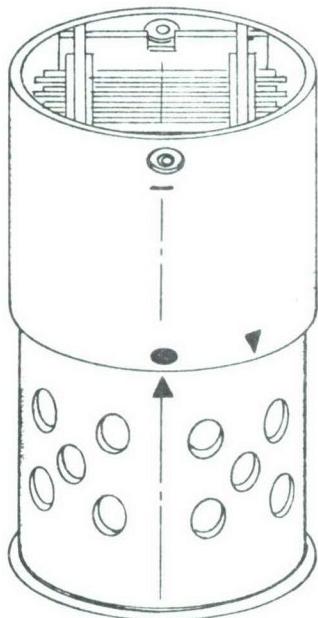
| <u>Number of Times Previously Used</u> | <u>Bars at Temp. Less Than 0°F</u> | <u>Bars at Temp. 0°F to 90°F</u> | <u>Bars at Temp. Greater Than 90°F</u> |
|--|------------------------------------|----------------------------------|--|
| 0 | 1-2/3 | 1-1/2 | 1-1/3 |
| 1 | 1-2/3 | 1-2/3 | 1-1/2 |
| 2 | 2 | 2 | 2 |
| 3 | 2-1/3 | 2-1/3 | 2 |
| 4 | 2-1/2 | 2-1/2 | 2-1/3 |
| 5 | 2-2/3 | 2-2/3 | 2-1/2 |



POWER SUPPLY
FIG 1



OPERATING POSITION
FIG 2



CLOSING POSITION
FIG 3

DISTRIBUTION LIST

Copies

| | |
|--|---|
| Commander US Army Materiel Command ATTN: AMCDL 5001 Eisenhower Avenue Alexandria, VA 22333 | 1 |
| Commander US Army Materiel Command ATTN: AMCRD 5001 Eisenhower Avenue Alexandria, VA 22333 | 3 |
| Commander US Army Materiel Command ATTN: AMCRD-P 5001 Eisenhower Avenue Alexandria, VA 22333 | 1 |
| Director of Defense, Research & Engineering Department of Defense WASH DC 20301 | 1 |
| Director Defense Advanced Research Projects Agency WASH DC 20301 | 3 |
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| Commander Eighth US Army ATTN: EAGO-P APO San Francisco 96301 | 1 |
| Commander Eighth US Army ATTN: G-3 O&T Division APO San Francisco 96301 | 1 |
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Commander
US MAC-T & JUSMAG-T
ATTN: MACTRD
APO San Francisco 96346

2

Senior Standardization Representative
US Army Standardization Group, Australia
c/o American Embassy
APO San Francisco 96404

1

Senior Standardization Representative
US Army Standardization Group, UK
Box 65
FPO New York 09510

1

Senior Standardization Representative
US Army Standardization Group, Canada
Canadian Forces Headquarters
Ottawa, Canada K1AOK2

1

Director
Air University Library
ATTN: AUL3T-64-572
Maxwell Air Force Base, AL 36112

1

Battelle Memorial Institute
Tactical Technical Center
Columbus Laboratories
505 King Avenue
Columbus, OH 43201

1

Defense Documentation Center (ASTIA)
Cameron Station
Alexandria, VA 22314

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Commander
Aberdeen Proving Ground
ATTN: STEAP-TL
Aberdeen Proving Ground, MD 21005

2

Commander
US Army Edgewood Arsenal
ATTN: SMUEA-TS-L
Aberdeen Proving Ground, MD 21010

1

US Marine Corps Liaison Officer
Aberdeen Proving Ground, MD 21005

1

Director
Night Vision Laboratory
US Army Electronics Command
ATTN: AMSEL-NV-D (Mr. Goldberg)
Fort Belvoir, VA 22060

1

Commander
US Air Force Special Communications Center (USAFSS)
ATTN: SUR
San Antonio, TX 78243

1

Commander
US Army Armament Command
ATTN: AMSAR-ASF
Rock Island, IL 61201

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